T.C.
MARMARA ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
İŞLETME ANABİLİM DALI
SAYISAL YÖNTEMLER (İNG.) BİLİM DALI

APPLICATIONS OF FORECASTING TECHNIQUES ON TURKISH FOREIGN TRADE DATA

Yüksek Lisans Tezi

AYHAN SEVİM

Danışman: PROF. DR. RAUF NİŞEL

İstanbul, 2006

Marmara Üniversitesi
Sosyal Bilimler Enstitüsü Müdürlüğü

Tez Onay Belgesi

İŞLETME Anabilim Dalı SAYISAL YÖNTEMLER (İNG) Bilim Dalı Yüksek Lisans öğrencisi AYHAN SEVİM nın APPLICATIONS OF FORECASTING TECHNIQUES ON TURKISH FOREIGN TRADE DATA adlı tez çalışması ,Enstitümüz Yönetim Kurulunun 13.07.2006 tarih ve 2006-07/11 sayılı kararı ile oluşturulan jüri tarafından Yüksek Lisans Tezi olarak kabul edilmiştir.

	Öğretim Üyesi Adı Soyadı	İmzası
Tez Savunma Tarihi :	4/9/2006	
1) Tez Danışmanı :	PROF. DR. RAUF NURETTİN NİŞEL	
2) Jüri Üyesi :	DOÇ. DR. ÖZCAN BAYTEKİN	
3) Jüri Üyesi :	YRD. DOÇ.DR. AYŞEGÜL BÖLÜKBAŞI	

GENEL BİLGİLER

İsim ve Soyadı	: Ayhan Sevim
Anabilim Dalı	: İşletme
Programı	: Sayısal Yöntemler (İngilizce)
Tez Danışmanı	: Prof. Dr. Rauf Nişel
Tez Türü ve Tarihi	: Yüksek Lisans - Eylül 2006
Anahtar Kelimeler	: Tahmin Yöntemleri, Dış Ticaret, İhracat, İthalat

ÖZET

Büyük veya küçük, özel ya da kamuya ait hemen hemen her kurum, açıkça ya da dolaylı olarak tahminden yararlanır, çünkü neredeyse her kurum, hakkında tam bir bilgiye sahip olmadığı geleceğin getireceği şartlara uyum sağlayabilmek için plan yapmak durumundadır. Çeşitli tahmin yöntemleriyle elde edilen tahminler, tüm bu tip planlamalar, strateji oluşturma, politika belirleme, programlama, satın alma, stok kontrolü ve genellikle karar alma faaliyetlerinin büyük bir bölümü için girdi olarak kullanılır.

Türkiye giderek daha açık bir ekonomi haline gelmektedir; dış ticaretin ülke ekonomisindeki payı istikrarlı bir şekilde artmaktadır. Uluslararası ticaret, hemen hemen tüm endüstrilerde tırmanışa geçmiştir. Bu tez kapsamında, tahmin yöntem ve tekniklerinin Türk Dış Ticaret verilerine uygulanması amaçlanmıştır. Yaklaşım tarzı, bazı nicel tahmin tekniklerinin, toplam ihracat ve ithalattan başlayarak, başlıca sektör ve alt-sektörlere hiyerarşik olarak uygulanması şeklindedir. Türkiye İstatistik Kurumu'ndan elde edilen Ocak 1996-Mayıs 2006 dönemini kapsayan verilere dayanarak, Haziran 2006-Mayıs 2007 dönemi için kısa-dönemli, zaman serileri tahminleri yapılmıştır.

GENERAL KNOWLEDGE

Name and Surname	: Ayhan Sevim
Field	: Business Administration
Programme	: Quantitative Methods (Lectured in English)
Supervisor	: Prof. Dr. Rauf Nişel
Degree Awarded and Date	: Master - September 2006
Keywords	: Forecasting Methods, Foreign Trade, Export, Import

ABSTRACT

APPLICATIONS OF FORECASTING TECHNIQUES ON TURKISH FOREIGN TRADE DATA

Almost every organization, large and small, private and public, uses forecasting either explicitly or implicitly, because almost every organization must plan to meet the conditions of the future for which it has imperfect knowledge. Predictions provided by various forecasting methods, are used as inputs for all types of planning, strategy formulation, policy-making, scheduling, purchasing, inventory control and a great majority of decision-making activities in general.

Turkey has been becoming a more open economy; the share of the foreign trade in the whole economy has been rising steadily. International trade has stepped up in almost all industries. In the scope of this thesis, it was aimed to apply forecasting methods and techniques on Turkish foreign trade data. The approach was to apply some quantitative forecasting techniques in a hierarchy, starting from total export and import to major sectors and subsectors. Based on data gathered Turkish Statistical Institute covering the period January 1996- May 2006, short-term, time series forecasts were produced for June 2006- May 2007 period.

ACKNOWLEDGEMENTS

I express sincere appreciation to Prof. Dr. Rauf Nişel for his guidance and insight throughout the research.

TABLE OF CONTENTS

Page Number

LIST OF TABLES

Page Number

LIST OF FIGURES

Page Number

INTRODUCTION

The field of forecasting is concerned with approaches to determining what the future holds. It is also concerned with the proper presentation and use of forecasts. With the development of more sophisticated forecasting techniques, along with the advent of computers- especially the proliferation of the personal computer and associated software- forecasting has received more and more attention.

Because the world in which organizations operate has always been changing forecasts have always been necessary. However, recent years have brought about increased reliance on methods that involve sophisticated data manipulation techniques. New technology and new disciplines have sprung up overnight; government activity at all levels has intensified; competition in many areas has become keener; international trade has stepped up in almost all industries. These factors have combined to create an organizational climate that is more complex, fast-paced, and competitive than ever before. Organizations that cannot react quickly to changing conditions and cannot foresee the future with any degree of accuracy are doomed to extinction.

Forecasts may be made for individual items or for combinations of items, up to and including the entire national output for some time period. The national economy is usually the highest level of aggregation in which business forecasters have interest. Industry sales forecasts are of considerable importance to planners or forecasters in the large firms in an economy. Firm sales forecast are often based on previously determined industry forecasts. There is an apparent hierarchy of forecasts: first, the national economy, then major subsectors, by the industry as a whole, and then sales by a particular firm.

In the scope of this thesis, it is aimed to introduce some forecasting concepts, methods and techniques on Turkish foreign trade data. The approach is to apply some forecasting techniques in a hierarchy, starting from total export and import to major subsectors and industries.

1. FORECASTING

1.1 Definition

"Thinking about the future and future events has a long history. People at all times wanted to know what was lying ahead. The fact remains that the future is unpredictable. Nevertheless, some developments can be foreseen and alternatives can be thought of. The definitions of forecasting vary to a certain extent, but they all have the view into the future in common. The future is unknown, but the broad, general directions can be guessed at and reasonably dealt with. Forecasting is the estimation of the short-, medium- or long-term future in a specific research area or according to the questions posed by means of scientific methodology"[1].

Merriam-Webster defines forecast as "to calculate or predict (some future event or condition) usually as a result of study and analysis of available pertinent data"[2]. Cambridge Dictionary of Statistics defines forecast as "the specific projection that an investigator believes is most likely to provide an accurate prediction of a future value of some process"[3]. Armstrong defines forecasting as "Estimating in unknown situations. *Predicting* is a more general term and connotes estimating for any time series, cross-sectional, or longitudinal data. *Forecasting* is commonly used when discussing time series"[4].

"The field of forecasting is concerned with approaches to determining what the future holds. It is also concerned with the proper presentation and use of forecasts. The terms "forecast," "prediction," "projection," and "prognosis" are typically used interchangeably. Forecasts may be conditional. That is, if policy A is adopted then X is likely, but if B is adopted then Y is most likely to occur. Often forecasts are of future values of a time-series; for example, the number of babies that will be born in a year, or the likely demand for compact cars. Alternatively, forecasts can be of one-off events such as the outcome of a union-management dispute or the performance of a new

[1] Kerstin Cuhls, "From Forecasting to Foresight Processes—New Participative Foresight Activities in Germany" **Journal of Forecasting** 22, p.93 (2003).
[2] Merriam-Webster Online Dictionary, http://www.m-w.com/dictionary/forecast (February, 2006).
[3] Brian S. Everitt, **Cambridge Dictionary of Statistics,** West Nyack, NY, USA: Cambridge University Press, 2002. p 149.
[4] J. Scott Armstrong, "Forecasting Principles"**,** *Forecasting Dictionary,* http://armstrong.wharton.upenn.edu/dictionary/definitions/forecasting.html (February 6, 2006).

recruit. Forecasts can also be of distributions such as the locations of terrorist attacks or the occurrence of heart attacks among different age cohorts. The field of forecasting includes the study and application of judgment as well as of quantitative (statistical) methods"[5].

1.2 History of Forecasting

Faced with questions about future, most of people have two reactions. People cannot know with certainty what the future will bring, and people would wish that the future were a little less obscure. Most of people have learned to live with the reality of uncertainty, but most of people would feel more comfortable if that uncertainty were diminished somewhat. To a certain extent this reflects natural human curiosity. Throughout the ages such curiosity has provided a market for the services of those who claimed to see the future. Ancient history is replete with stories of consultations of oracles and soothsayers[6]. "Forecasting is often frowned upon, it has also been banned. In Rome in 357 A. D., Emperor Constantino issued an edict forbidding anyone "to consult a soothsayer, a mathematician, or a forecaster … May curiosity to foretell the future be silenced forever" [7].

"Individuals and organizations have operated for hundreds of years by planning and forecasting in an intuitive manner. It was not until the 1950s that formal approaches became popular. Since then, such approaches have been used by business, government, and nonprofit organizations"[8]. "Forecasting has been moved into a disciplinary category closely associated with the scientific method. The systematic application of data analysis and projection models, combined with statistical evaluation of the significance of and reliability of estimates, have contributed to this evolution from subjective methods of determining the future to empirically validated methods for making projections. The projections have covered a wide range of social and business needs,

---

[5] Armstrong, http://mktg-sun.wharton.upenn.edu/forecast/FAQ.html (February 6, 2006).
[6] Paul Newbold, Theodore Bos, **Introductory Business and Economic Forecasting**, 2nd Edition, USA: South-Western Publishing Co., 1994, p.1.
[7] Armstrong (Editor).,**Principles of Forecasting. A Handbook for Researchers and Practitioners,** Hingham, MA, USA: Kluwer Academic Publishers, 2001. p.2.
[8] Armstrong, "Strategic Planning And Forecasting Fundamentals", **General Economics and Teaching 0502066, EconWPA,** http://129.3.20.41/eps/get/papers/0502/0502066.pdf (June, 2006).

from economic and political forecasting to forecasting demand for particular products for a company competing for its share of the global market."[9] "Researchers involved in forecasting have gained respect and some, such as Lawrence R. Klein, Wassily W. Leontief, Franco Modigiliani, and James Tobin, have received Nobel prizes in economics"[10].

"With the development of more sophisticated forecasting techniques, along with the advent of computers- especially the proliferation of the personal computer and associated software- forecasting has received more and more attention. Every manager now has the ability to utilize very sophisticated data analysis techniques for forecasting purposes, and an understanding of these techniques is essential. For this same reason, consumers of forecasts (managers) must be alert to the improper use of forecasting techniques because inaccurate forecasts can lead to poor decisions.

New techniques for forecasting continue to be developed as management concern with the forecasting process continues to grow. A particular focus of this attention is on the errors that are an inherent part of any forecasting procedure. Predictions of outcomes are rarely precise; the forecaster can only endeavor to make the inevitable errors as small as possible"[11].

1.3 The Scope of Forecasting

Decision makers need forecasts only if there is uncertainty about the future. Thus, we have no need to forecast whether the sun will rise tomorrow. There is also no uncertainty when events can be controlled; for example, you do not need to predict the temperature in your home. Many decisions, however, involve uncertainty, and in these cases, formal forecasting procedures can be useful[12]. According to current economic theory business decision-makers should permanently be occupied with forecasting or, to use another term, the formation of expectations. In order to make choices firms are

[9] Mark J. Lawless, "Forecasting in the 1990's", **The Journal of Business Forecasting Methods & Systems***;* Fall 1997; 16, 3; ABI/INFORM Global pg. 9.
[10] Armstrong,*Principles of Forecasting. A Handbook for Researchers and Practitioners,* p.2.
[11] John E. Hanke, Dean W. Wichern, **Business Forecasting**, 8th Edition, USA: Pearson Prentice Hall, 2005. p.1.
[12] Armstrong, *Principles of Forecasting. A Handbook for Researchers and Practitioners.,* p 2-3

presumed to continually acquire information regarding future outcomes of present actions[13].

There are alternatives to forecasting. A decision maker can buy insurance (leaving the insurers to do the forecasting), hedge (bet on both heads and tails), or use "just-in-time" systems (which pushes the forecasting problem off to the supplier). Another possibility is to be flexible about decisions.

Forecasting is often confused with planning. Planning concerns what the world should look like, while forecasting is about what it will look like. Figure 1-1 summarizes the relationships[14]. The formal practice of forecasting and planning has risen to prominence in business, nonprofit, and public organizations within only a few decades. Furthermore, annual expenditure related to forecasting and planning involves billions of dollars[15].

Planners can use forecasting methods to predict the outcomes for alternative plans. If the forecasted outcomes are not satisfactory, they can revise the plans, then obtain new forecasts, repeating the process until the forecasted outcomes are satisfactory. They can then implement and monitor the actual outcomes to use in planning the next period. However, in practice, many organizations revise their forecasts, not their plans. They believe that changing the forecasts will change behavior.

Forecasting serves many needs. It can help people and organizations to plan for the future and to make rational decisions. It can help in deliberations about policy variables[16].

---

[13] Tobias F. Rotheli, "Forecasting among Alternative Strategies in the Management of Uncertainty", **Managerial and Decision Economics**, Vol. 19, No. 3. (May, 1998), p. 179.
[14] Armstrong, *Principles of Forecasting. A Handbook for Researchers and Practitioners.,* p 2-3.
[15] Robin M. Hogarth and Spyros Makridakis, "Forecasting and Planning: An Evaluation", **Management Science**, Vol. 27, No. 2. (Feb., 1981), p.115.
[16] Armstrong, *Principles of Forecasting. A Handbook for Researchers and Practitioners.,* p 2-3.

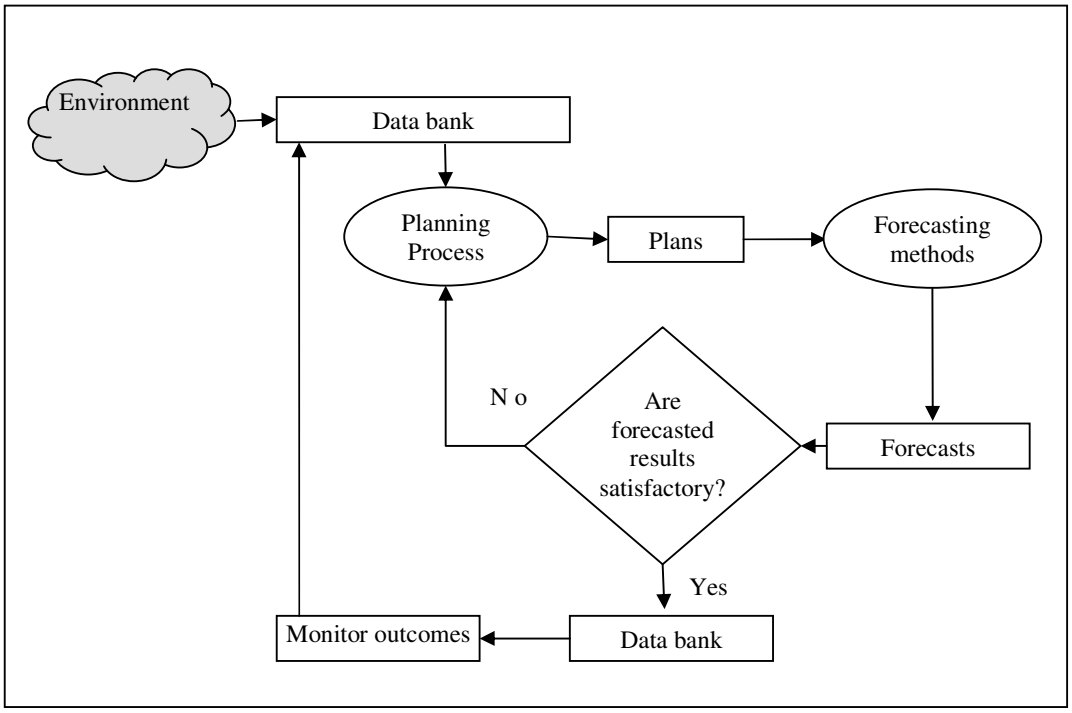

Figure 1-1 Framework for forecasting and planning

Source: Adopted from Armstrong, **Principles of Forecasting**, p 2-3

1.4 The Need for Forecasting

"Frequently there is a time lag between awareness of an impending event or need and occurrence of that event. This lead time is the main reason for planning and forecasting. If the lead time is zero or very small, there is no need for planning. If the lead time is long, and the outcome of the final event is conditional on identifiable factors, planning can perform an important role. In such situations, forecasting is needed to determine when an event will occur or a need arise, so that appropriate actions can be taken.

In management and administrative situations the need for planning is great because the lead time for decision making ranges from several years (for the case of capital investments) to a few days or hours (for transportation or production schedules)

to a few seconds (for telecommunication routing or electrical utility loading). Forecasting is an important aid in effective and efficient planning"[17].

Because the world in which organizations operate has always been changing forecasts have always been necessary. However, recent years have brought about increased reliance on methods that involve sophisticated data manipulation techniques. New technology and new disciplines have sprung up overnight; government activity at all levels has intensified; competition in many areas has become more keen; international trade has stepped up in almost all industries; social help and service agencies have been created and have grown; and the Internet has become an important source of data and decision making information. These factors have combined to create an organizational climate that is more complex, fast-paced, and competitive than ever before. Organizations that cannot react quickly to changing conditions and cannot foresee the future with any degree of accuracy are doomed to extinction.

Computers, along with the quantitative techniques they make possible, have become more than a convenience for modern organizations; they have become essential. The complexities just discussed generate tremendous amounts of data and an overwhelming need to extract useful information. The modern tools of forecasting, along with the capabilities of the computer, have become indispensable for organizations operating in the modern world.

Who needs forecasts? Almost every organization, large and small, private and public, uses forecasting either explicitly or implicitly, because almost every organization must plan to meet the conditions of the future for which it has imperfect knowledge.[18] "Organizations establish goals and objectives, seek to predict environmental factors, then select actions that they hope will result in attainment of these goals and objectives. The need for forecasting is increasing as management attempts to decrease its dependence on chance and becomes more scientific in dealing with its environment. Since each area of organization is related to all others, a good or

[17] Spyros Makridakis, Steven C. Wheelwright and Rob J. Hyndman, **Forecasting: Methods and Applications**, 3rd Edition, USA: John Wiley& Sons, 1998. p.2.
[18] Hanke and Wichern, p.1-3.

bad forecast can affect the entire organization"[19]. "The need for forecasts cuts across all functional lines as well as all types of organizations. Forecasts are needed in finance, marketing, personnel, and production areas, in government and profit-seeking organizations, in small social clubs, and in national political parties" [20].

"The forecast is not an end in itself; rather it is a means to an end. The forecasting system is a part of a larger management system and, as a subsystem, interacts with other components of the total system to determine overall performance"[21].

Predictions, provided by the various forecasting methods, are used as inputs for all types of planning, strategy formulation, policy-making, scheduling, purchasing, inventory control and a great majority of decision-making activities in general. There is no question that the role of forecasting is becoming central and its necessity indisputable[22].

1.5 Type of Forecasts

Forecasting procedures might first be classified as for the long term or the short term. The distinction between short- and long-run forecasts used to be clear: the short run was a period of time within a planning period and the long run was time outside the planning period. Since most companies used (and still use) annual planning periods, the long run was often thought of as just longer than a year[23]. Long-term forecasts are necessary to set the general course of an organization for the long run; thus they become the particular focus of top management. Short-term forecasts are used to design immediate strategies and are used by middle management and first-line management to meet the needs of immediate future[24].

---

[19] Makridakis et al., *Forecasting: Methods and Applications,* p.5.
[20] Hanke and Wichern, p.3.
[21] Douglas C. Montgomery, Lynwood A. Johnson, John S. Gardiner, **Forecasting and Time Series Analysis**, 2nd Edition, USA: McGraw-Hill, Inc., 1990. p.4.
[22] Spyros Makridakis, **The Forecasting Accuracy of Major Time Series Methods**, Great Britain: John Wiley & Sons, 1984, p.1.
[23] Dominique M. Hanssens, **Market Response Models. Econometric and Time Series Analysis,** 2nd Edition, Hingham, MA, USA: Kluwer Academic Publishers, 2001. p 375.
[24] Hanke and Wichern, p.3.

Forecasts might also be classified in terms of their position on a micro – macro continuum, that is, on the extent to which they involve small details versus large summary values. For example, a plant manager might be interested in forecasting the number of workers needed for the next several months (a micro forecast), whereas the federal government is forecasting the total number of people employed in the entire country (a macro forecast). Again, different levels of management in an organization tend to focus on different levels of the micro-macro continuum. Top management would be interested in forecasting the sales of the entire company, for example, whereas individual salespersons would be much more interested in forecasting their own sales volumes.

Forecasting procedures can also be classified according to whether they are more quantitative or qualitative. At one extreme, a purely qualitative technique requires no overt manipulation of data. Only the "judgment" is actually a result of the mental manipulation of past historical data. At the other extreme, purely quantitative techniques need no input of judgment; they are mechanical procedures that produce quantitative results. Same quantitative procedures require a much more sophisticated manipulation of data than do others, of course[25].

Quantitative forecasting can be applied when three conditions exist:

1. Information about the past is available.
2. This information can be quantified in the form of numerical data.
3. It can be assumed that some aspects of the past data will continue into the future.

This last condition is known as the assumption of continuity; it is an underlying premise of all quantitative and many qualitative forecasting methods.

Quantitative forecasting techniques vary considerably, having been developed by diverse disciplines for different purposes. Each has its own properties, accuracies, and costs that must be considered in choosing a specific method. Quantitative forecasting procedures fall on a continuum between two extremes: intuitive or ad hoc

[25] Hanke and Wichern, p.3-4.

methods, and formal quantitative methods based on statistical principles. The first is based on empirical experience that varies widely from business to business, product to product, and forecaster to forecaster. Intuitive methods are simple and easy to use but not always as accurate as formal quantitative methods. Also, they usually give little or no information about the accuracy of the forecast. Because of these limitations, their use has declined as formal methods have gained in popularity. Many businesses still use these methods, either because they do not know about simple formal methods or because they prefer a judgmental approach to forecasting instead of more objective approaches.

Formal statistical methods can also involve extrapolation, but it is done in a standard way using a systematic approach that attempts to minimize the forecasting errors.

Persons unfamiliar with quantitative forecasting methods often think that the past cannot describe the future accurately because everything is constantly changing. After some familiarity with data and forecasting techniques, however, it becomes clear that although nothing remains exactly the same, some aspects of history do repeat themselves in a sense. Application of the right method can often identify the relationship between the variable to be forecasted and time itself (or several other variables), making improved forecasting possible.

An additional dimension for classifying quantitative forecasting methods is to consider the underlying model involved. There are two major types of forecasting models: time series and explanatory models. Explanatory models assume that the variable to be forecasted exhibits an explanatory relationship with one or more independent variables.

Explanatory models can be applied to many systems- national economy, a company's market, or a household. The purpose of the explanatory model is to discover the form of the relationship and use it to forecast future values or the forecast variable. According to explanatory forecasting, any change in inputs will affect the output of the

system in a predictable way, assuming the explanatory relationship will not change (assumption of continuity).

Unlike explanatory forecasting, time series forecasting treats the system as a black box and makes no attempt to discover the factors affecting its behavior. Therefore, prediction of the future is based on past values of a variable and/or past errors, but not on explanatory variables which may affect the system. The objective of such time series forecasting methods is to discover the pattern in the historical data series and extrapolate that pattern into the future.

There are two main reasons for wanting to treat a system as a black box. First, the system may not be understood, and even if it were understood it may be extremely difficult to measure the relationships assumed to govern its behavior. Second, the main concern may be only to predict what will happen and not to know why it happens.

Both time series and explanatory models have advantages in certain situations. Time series models can often be used more easily to forecast, whereas explanatory models can be used with greater success for policy and decision making. Whenever the necessary data are available, a forecasting relationship can be hypothesized either as a function of time or as a function of explanatory variables, and tested[26].

Among all the models, Time Series Models are, by and large, the simplest-easier to understand and use. Among the three models, Time Series models are the ones most often used in business (71%), followed by Cause-and-Effect models (19%) and Judgmental models (10%)[27].

Whereas time-series and casual models rely on quantitative data, qualitative models attempt to incorporate judgmental or subjective factors into the forecasting model. Opinions by expert, individual experiences and judgments, and other subjective factors may be considered. Qualitative models are especially useful when subjective factors are expected to be very important or when accurate quantitative data are difficult

[26] Makridakis et al., *Forecasting: Methods and Applications*, p.9-12.
[27] Chaman L Jain, "Business Forecasting Practices in 2003", **The Journal of Business Forecasting Methods & Systems;** Fall 2004; 23, 3; ABI/INFORM Global pg. 2.

to obtain. Delphi method, jury of executive opinion, sales force composite and consumer market surveys can be given as examples of qualitative or judgmental approaches[28].

1.6 Macro Economic Forecasting Considerations

Several levels of aggregation in forecasts can be distinguished. That is, forecasts may be made for individual items or for combinations of items, up to and including the entire national output for some time period. The national economy is usually the highest level of aggregation in which business forecasters have interest. Industry sales forecasts are of considerable importance to planners or forecasters in the large firms in an economy. Firm sales forecast are often based on previously determined industry forecasts. There is an apparent hierarchy of forecasts: first, the national economy, then major subsectors, by the industry as a whole, and then sales by a particular firm[29].

General economic conditions set the tone for all parts of the economy. Good forecasting for an industry or firm begins, therefore, with a good analysis of the overall economy. Within this framework, the analyst must then take account of the particular factors that are most important to his own industry. In some cases, the sales of an industry may correlate fairly directly with one or more of the elements of the national income and product accounts—lumber sales with home construction, for example, or sales of nondurable consumer goods with consumer income and total consumer spending. Forecasting for industries that produce basic materials usually requires a series of projections for specific markets. A steel forecast might be based on the outlook for such major steel markets as automobiles, construction, and metal containers. The

[28] Barry Render, Ralph M. Stair, Jr., **Quantitative Analysis for Management**, 7th Edition, USA: Prentice-Hall, Inc., 2000, p.157-158.
[29] Roger K. Chisholm, Gilbert R. Whitaker, Jr., **Forecasting Methods,** USA: Richard D. Irwin Inc., 1972, p.5.

basic forecast would then be adjusted for expected shifts in exports and imports of steel and for changes in inventories of steel or steel-using products[30].

Economic forecasting is a big business. Governments, banks, financial institutions and commercial organizations and corporations of every shape and size are involved in it. Every single minute of every single day the fortunes of individuals, companies, and sometimes it seems whole nations, are gambled on forecasts of the price of anything from coffee beans to money itself. As the recent events in the world economy show, economic forecasting and its consequences have the potential to affect just about anyone and everyone[31].

In recent decades, economic forecasting has taken on an increasingly important role. Expected future economic developments are discussed daily, both in specialized form and more broadly. News carrying risks for the economic outlook can send financial markets into jitters at any time. Hence, an articulated assessment of economic prospects is now widely seen as an indispensable ingredient in economic policy-making, as well as for private-sector decisions. To cope with uncertainty and anticipate the implications of their behavior, nearly every agent or collective entity has to rely on some description of how the economy is likely to evolve, that is, on an economic forecast[32].

We usually think of forecasting in terms of predicting important variables for an individual company or perhaps for one component of a company. Monthly company sales, unit sales for one of a company's stores, an absent hours per employee per month in a factory are examples.

By contrast, there is growing interest in forecasting important variables for the entire economy of a country or for the global economy. Much work has been done in evaluating methods for doing this kind of overall economic forecasting, called

---

[30] "Economic Forecasting", *Encyclopædia Britannica. 2006*. Encyclopædia Britannica Premium Service. http://www.britannica.com/eb/article-25801 (June 2006)
[31] Robert Evans. **Macroeconomic Forecasting : A Sociological Appraisal.** London, , GBR: Routledge, 1999. p 1.
[32] Nicholas Carnot, **Economic Forecasting**, Gordonsville, VA, USA: Palgrave Macmillan, 2005. p xvii.

macroeconomic forecasting. Examples of interest to the government of the United States are unemployment rate, gross domestic product, and the prime interest rate. Economic policy is based, in part, on projections of important economic indicators such as these. For this reason, there is great interest in improving forecasting methods that focus on overall measures of a country's economic performance.

One of the chief difficulties in developing accurate forecasts of overall economic activity is an unexpected and significant shift in a key economic factor. Large changes in oil prices, inflation surges, and broad policy changes by a country's government, are examples of shifts in a key factor that can affect the global economy.

The possibility of such significant shifts in the in the economic scene has raised a key question in macroeconomic forecasting: Should the forecasts generated by the forecasting model be modified using the forecaster's judgment? Current work on forecasting methodology often involves this question.

Much work, both theoretical and practical, continues on the subject of macroeconomic forecasting. Considering the importance of accurate economic forecasting to economic policy formulation in a country, continuing attention to this kind of forecasting can be expected in the future[33].

1.7 Choosing a Forecasting Method

Selecting among competing forecasting methods is a problem faced regularly by many organizations. Changing market conditions may make one technique used for several years unacceptable or changes in personnel or technology may lead an organization to reconsider operating procedures[34].

Several factors should be considered in choosing a forecasting method. The level of detail must be considered. Are forecasts of specific details needed (a micro

[33] Hanke and Wichern, p.4.
[34] Robert Fildes, "Evaluation of Aggregate and Individual Forecast Method Selection Rules", **Management Science**, Vol. 35, No.9. (Sep., 1989), p.1056.

forecast)? Or is the future status of some overall or summary factor needed (a macro forecast)? Is the forecast needed for some point in the near future (a short-term forecast) or for a point in the intermediate or distant future (a long-term forecast)? And to what extent are qualitative (judgment) and quantitative (data-manipulative) methods appropriate?

The overriding consideration in choosing a forecasting method is that the results must facilitate the decision-making process of the organization's managers. Rarely does one method work for all cases. Different products (for example, new versus established), goals (such as simple prediction versus the need to control an important business driver of future values), and constraints (such as cost, required expertise, immediacy) must be considered when selecting a forecasting method. With the availability of current forecasting software, it is best to think of forecasting methods as generic tools that can be applied simultaneously. Several methods can be tried in a given situation. The methodology producing the most accurate forecasts in one case may not be the best methodology in another situation. However, the method(s) chosen should produce a forecast that is accurate, timely, and understood by management so that the forecast can help produce better decision[35].

1.8 Forecasting Steps

All formal forecasting procedures involve extending the experiences of the past into the future. Thus they involve the assumption that the conditions that generated past data are indistinguishable from the conditions of the future except for those variables explicitly recognized by the forecasting model.

The future is not always like the past. To the extent it is, quantitative forecasting methods work well. To the extent it isn't, inaccurate forecasts can result. However, it is generally better to have some reasonably constructed forecast than no forecast. The recognition that forecasting techniques operate on the data generated by

[35] Hanke and Wichern, p.4-5.

historical events leads to the identification of the following five steps in the forecasting process:

1. Problem formulation and data collection
2. Data manipulation and cleaning
3. Model building and evaluation
4. Model implementation (the actual forecast)
5. Forecast evaluation[36].

[36] Hanke and Wichern, p. 6-7.

2. TURKISH FOREIGN TRADE

2.1 Main Developments in Turkey's Foreign Trade 1990-2004

The year 1980 represents a significant milestone for the Turkish economy and foreign trade policy. The second petrol crises experienced in late 1970s contributed to the decline in the world economy, which had a direct impact on the Turkish economy. Forced by the economic pressure experienced in the country, the government implemented some radical measures entitled "January 24 Decisions" and, subsequently, a new economic package was put into effect[37]. Beginning from the year 1980, Turkey changed its economic development policy from "import substituting industrialization" to "export led growth" strategy. Economy opened up to world trade, export-promoting incentives were initiated (including tax exemptions, rebates and favorable credit terms), direct import controls have been eliminated, and quantity restrictions have been dismantled. State intervention in the economy was reduced to minimum level. As a result of these efforts, Turkey has increased her share from world markets, from 0,15% in 1980 to 0,6% in the year 2003. Between 1980 and 2004 exports of Turkey has increased from 2,9 billion dollars to 63 billion dollars. Structure of exported goods has also changed much from mainly agricultural products and raw materials to higher value added industrial products. Transformation still continues with increasing exports of transportation vehicles and office equipments.

Turkey became a more and more open economy as time passed. The figure 2-1 shows the share of foreign trade in GNP of Turkey.

[37] Turkish Daily News, "Development of Turkish Foreign Trade", http://www.turkishdailynews.com.tr/archives.php?id=9528 (April, 2006).

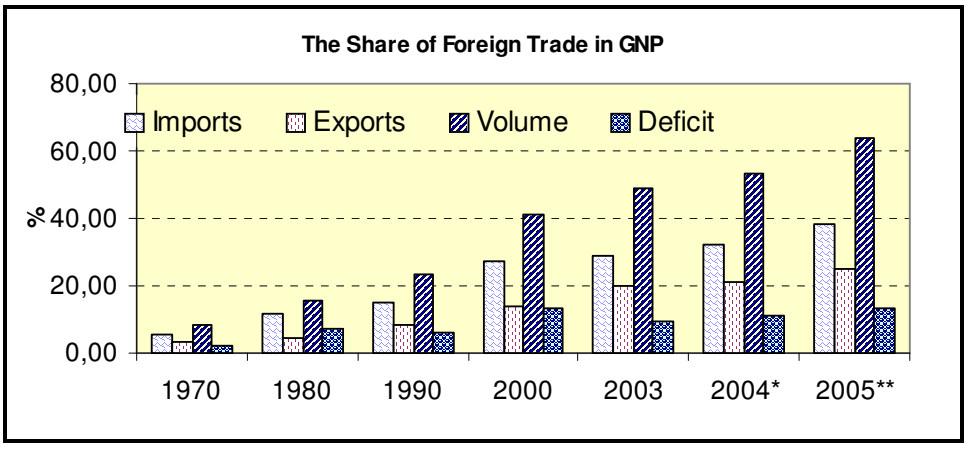

Figure 2-1 The Share of Foreign Trade in GNP.

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.1.

The share of the foreign trade in the whole economy has risen steadily starting from 1980's. The volume of foreign trade consisted of 8.6 percent of the GNP in 1970 while this share rose to 15.7 and 23.4 percent in 1980 and 1990, respectively.

In 2000 foreign trade volume rose to 82.3 billion USD while the export/import ratio was 51 percent. The share of foreign trade volume in GNP was 40.8 percent. In 2004 it's expected that foreign trade consists roughly 55 percent of GNP, while export/import ratio is 64,7 percent. Also, the share of industrial products in total exports reached to 84,8 percent, while it was 83,7 percent in 2003.

Turkey's foreign trade gained momentum especially in 1990s. This period was affected by changes and developments in the world economy and political structure.

Exports which were $ 13 billion in 1990, rose to $ 21.6 billion in 1995 and $ 27.8 billion in 2000. During 1990-1995, the average annual growth rate of exports was 13.4 percent, while it was 5.7 percent between 1995 and 2000. The primary reason of high growth rate of exports during the period of 1990-1995 was a considerable increase in the import demand of European Union. Also, in 1994 economic stabilization measures had an important impact on this development. Moreover, the devaluation of TL in 1994 in the framework of April 5 decisions gave a substantial competitiveness to Turkish exporters. However, in 1997 and 1998 as a result of economic crises in Newly

Industrialized Asian Countries and in Russian Federation, increase in the world trade and world demand shrank. This had a significant impact on Turkey's export performance in 1999, which experienced only 2.7 percent increase. On the other hand, after the year 2000, Turkey's exports growth rate is accelerating at an important pace. Turkey showed a great performance in exports in 2001, 2002, 2003 and 2004. Turkey's exports grew by 12.8, 15.1, 31 and 33,6 percent respectively in these four years.

Record rate of export growth in the year 2004 is due to the influence of many factors. First of all, Turkish industrial production gained some competitiveness, despite appreciation of TL, as a result of low real wages and stagnant energy prices (mainly electricity). Secondly, low real interest rates in comparison to previous years lowered borrowing cost for producers and exporters. Thirdly, technological improvements have increased either by transfers because of joint ventures (especially in automotive industry) or imports of technology. Finally, productivity accelerated in recent years while consumption was stagnant until mid 2003, creating excess supply, which were in turn directed towards exports. In Turkey imports of intermediate and capital goods are important in production. So, due to the depreciation of $ against EURO and TL, Turkey benefited from importing cheaper intermediate goods from countries where prices are set according to US Dollar (like East Asian countries –especially China-) and exporting final products mainly to EU countries.

	Turkey's Foreign Trade ($ Million)							**% Change**
	1990	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**	**2004/ 2003**
Exports (FOB)	12 959	21 637	27 775	31 334	36 059	47 253	63 121	33,6
Imports (CIF)	22 302	35 709	54 503	41 399	51 554	69 340	97 540	40,7
Volume	35 261	57 346	82 278	72 733	87 613	116 593	160 661	37,8
Balance	- 9 343	- 14 072	- 26 728	- 10 065	- 15 495	- 22 087	- 34 419	55,8
Exp./Imp.	58,1	60,6	51,0	75,7	69,9	68,1	64,7	-5,0

Table 2-1 Turkey's Foreign Trade

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.3.

Imports of Turkey, which were $ 22.3 billion in 1990, grew by 12 percent annually on average between 1990 and 1995, and reached $ 35.7 billion in 1995. The

average annual growth rate between 1995 and 2000 was 10,5 percent. Turkey's membership to the World Trade Organization in 1995 and the entrance to the final stage of Customs Union with the European Union in 1996 and the growing economy were reasons of rapid growth rate of Turkey's imports during the last 8 years. In 2000, a 6.3 percent GNP growth, a sharp fall in interest rates, appreciation of TL in real terms, depreciation of EURO against US Dollar, and a sharp increase in crude oil prices brought about a 34 percent rise in imports. After such a steep increase, imports decreased by 24 percent in the following year when economy shrank, too. 2002 and 2003 was the years of recovery after the crises in 2001, when imports and economy grew together. The increase in imports was 24.5 percent in 2002 and 34.5 percent in 2003. In the year 2004 Turkey is expected to have reached a spectacular GNP growth rate of nearly %10. This, together with high rate of increase in private investment, refreshed private consumption, revaluation of TL, have caused imports of Turkey to rise in the year 2004 by 40,4%.

The export/import ratio declined from 58.1 percent in 1990 to 51.0 percent in 2000 as a result of the high rate of increase in imports. But then, this ratio rose to 68.4 by the year of 2003. In the year 2004, although exports has increased at record rate, since imports has increased faster, export import ratio has declined to 64,7%.

2.2 Turkey's Foreign Trade and Share in GNP

The average annual increase in volume of trade decreased from 12.5 percent in 1990-1995 to 8.7 percent in 1995-2000. The volume of foreign trade rose to $ 82.3 billion at the end of 2000. Share of trade volume in GNP continued to increase until 2004 and has reached to 54,7%. This number was only 23,4% in the year 1990.

Trade deficit (CIF imports – FOB exports) increased between 1990 and 1995 and rose from $ 9,3 billion to $ 14 billion. Between 1995 and 2000 trade deficit continued to grow and reached to 13,3% of the GNP in the year 2000. Again as a consequence of 2001 crisis, the share of foreign trade deficit shrank to 6.8 percent and in the years afterwards it has again begun to rise and reached to 11,7% in the year 2004.

	Turkey's Foreign Trade and GNP ($ Million)						
	1990	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**
Exports (FOB)	12 959	21 637	27 775	31 334	36 059	47 253	63 121
Imports (CIF)	22 302	35 709	54 503	41 399	51 554	69 340	97 540
Volume	35 261	57 346	82 278	72 733	87 613	116 593	160 661
Deficit	- 9 343	- 14 072	- 26 728	- 10 065	- 15 495	- 22 087	- 34 419
GNP	**150 758**	**170 076**	**201 439**	**148 215**	**180 892**	**239 235**	**293 300**
	Share in GNP (%)						
	1990	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**
Exports (FOB)	8,6	12,7	13,8	21,1	19,9	19,8	21,5
Imports (CIF)	14,8	21,0	27,1	27,9	28,5	29,0	33,2
Volume	23,4	33,7	40,8	49,1	48,4	48,7	54,7
Deficit	-6,2	-8,3	-13,3	-6,8	-8,6	-9,2	-11,7
GNP	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Table 2-2 Turkey's Foreign Trade and GNP

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.4.

2.3 Main Developments in Exports

Sectoral Breakdown of Turkey's Exports by WTO Definition ($ Million)							
	1990	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**
1-Agricultural Products	**3 300**	**4 555**	**3 855**	**4 349**	**4 052**	**5 257**	**6 484**
i-Food	2 905	4 239	3 543	3 997	3 668	4 735	5 875
ii-Agricutural Raw Materials	395	316	313	352	384	522	609
2-Mining Products	**876**	**1 003**	**1 157**	**1 236**	**1 497**	**2 011**	**2 871**
3-Manufactures	**8 778**	**16 064**	**22 699**	**25 661**	**30 288**	**39 594**	**53 476**
i-Iron and Steel	1 490	1 972	1 865	2 500	2 831	3 342	5 974
ii-Chemicals	747	890	1 243	1 367	1 523	1 893	2 563
iii-Other Semi manufactures	672	1 455	2 280	2 625	3 139	4 143	5 480
iv-Machinery and Transport Equi.	855	2 406	5 740	7 153	8 632	12 370	18 265
v-Textiles	1 440	2 532	3 706	3 943	4 268	5 262	6 426
vi-Clothing	3 331	6 121	6 586	6 661	8 094	9 962	11 191
vii-Other Consumer Goods	243	687	1 279	1 413	1 800	2 622	3 477
4-Other Products	5	15	63	89	222	391	285
TOTAL	**12 959**	**21 637**	**27 775**	**31 334**	**36 059**	**47 253**	**63 121**

Table 2-3 Sectoral Breakdown of Turkey's Exports by WTO Definition

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.5.

Sectoral Export Growth (%)						
	1995/ 1990	**2000/ 1995**	**2001/ 2000**	**2002/ 2001**	**2003/ 2002**	**2004/ 2003**
1-Agricultural Products	**7,6**	**-3,1**	**12,8**	**-6,8**	**29,7**	**23,3**
i-Food	9,2	-3,3	12,8	-8,2	29,1	24,1
ii-Agricutural Raw Materials	-4,0	-0,2	12,5	9,1	36,0	16,6
2-Mining Products	**2,9**	**3,1**	**6,8**	**21,1**	**34,3**	**42,8**
3-Manufactures	**16,6**	**8,3**	**13,0**	**18,0**	**30,7**	**34,8**
i-Iron and Steel	6,5	-1,1	34,0	13,2	18,1	78,7
ii-Chemicals	3,8	7,9	10,0	11,4	24,3	35,4
iii-Other Semi manufactures	23,3	11,3	15,1	19,6	32,0	32,3
iv-Machinery and Transport Equi.	36,3	27,7	24,6	20,7	43,3	47,7
v-Textiles	15,2	9,3	6,4	8,2	23,3	22,1
vi-Clothing	16,8	1,5	1,1	21,5	23,1	12,3
vii-Other Consumer Goods	36,5	17,2	10,5	27,4	45,6	32,6
4-Other Products	**40,0**	**64,0**	**41,3**	**149,4**	**76,0**	**-27,0**
TOTAL	**13,4**	**5,7**	**12,8**	**15,1**	**31,0**	**33,6**

Table 2-4 Sectoral Export Growth

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.5.

Sectoral Share of Turkey's Exports by WTO Definition (%)							
	1990	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**
1-Agricultural Products	**25,5**	**21,1**	**13,9**	**13,9**	**11,2**	**11,1**	**10,3**
i-Food	22,4	19,6	12,8	12,8	10,2	10,0	9,3
ii-Agricultural Raw Materials	3,0	1,5	1,1	1,1	1,1	1,1	1,0
2-Mining Products	**6,8**	**4,6**	**4,2**	**3,9**	**4,2**	**4,3**	**4,6**
3-Manufactures	**67,7**	**74,2**	**81,7**	**81,9**	**84,0**	**83,8**	**84,7**
i-Iron and Steel	11,5	9,1	6,7	8,0	7,9	7,1	9,5
ii-Chemicals	5,8	4,1	4,5	4,4	4,2	4,0	4,1
iii-Other Semi manufactures	5,2	6,7	8,2	8,4	8,7	8,8	8,7
iv-Machinery and Transport Equi.	6,6	11,1	20,7	22,8	23,9	26,2	29,0
v-Textiles	11,1	11,7	13,3	12,6	11,8	11,1	10,2
vi-Clothing	25,7	28,3	23,7	21,3	22,4	21,1	17,8
vii-Other Consumer Goods	1,9	3,2	4,6	4,5	5,0	5,5	5,5
4-Other Products	**0,0**	**0,1**	**0,2**	**0,3**	**0,6**	**0,8**	**0,5**
TOTAL	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Table 2-5 Sectoral Share of Turkey's Exports by WTO Definition

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.6.

When exports by main sectors are examined there seems to be a steady decrease in the share of exports of agricultural products until 2004. The share of export of agricultural products in total exports decreased from its %25,5 in 1990 to 10.3 percent in 2004. Exports of the agricultural products decreased on average by 3.1 percent annually between 1995 and 2000. On the other hand, exports of agricultural products showed a good performance especially in 2003 and 2004, rised by %29,7 and %23,3 respectively. But even in these years since increase in agricultural products exports was lower than increase of total exports, share of agricultural products continued to decline. The value of exports of mining products has increased from 876 million dollars in 1990 to 2,9 billion dollars in 2004 however, the share of these products in total exports decreased from %6,8 to %4,6 in the mean time. The export share of mining products has shown a slight improvement in the last years.

On the contrary, export of manufactured products increased its share in total exports from 1990 to 2004. This share rose from 67.7 percent in 1990 to 84.7 percent in 2004. The export of manufactures increased by 16,6 percent annually between 1990 and 1995. This rate of increase in exports of manufactures decelerated in the following five years period, realizing 8.3 percent annual increase between 1995 and 2000. But after that, the rate of increase in the exports of manufactured goods reached to 30.7 percent annual growth rate in the year 2003 and 34.8 percent in 2004.

There was a significant development in exports of Turkish manufactures, especially in the last 7 years. The machinery and transport equipment sector had the most significant share in exports in 2003 and 2004 and its share in total exports increased to 29 percent from its level of 6.6 percent in the year 1990. Export of clothing sector made up 28.3 percent of total exports in 1995 but its share decreased to 17.8 percent in 2004.

The graph below shows export structure of Turkey in comparison to world trade structure in time. In Turkey's exports, the share of agricultural and mining products was higher compared to that of world in 1980 while it fell below the world level in 2003. In 1980, the share of the exports of the traditional industrial sectors (clothing, textile, iron & steel) was higher in Turkey compared to that of the world. But

in 2003 while the share of the exports of traditional sectors stayed almost constant in the world exports, it rose enormously in Turkey's exports.

On the other hand, Turkey performed well in the office and telecom equipment, automotive industry and other machines exports during this period and share of these sectors in Turkey's exports has increased much. Share of automotive industry has risen from %1,74 in 1980 to %10,43 in the year 2003 and thus exceeded the sector's share in world trade. While office and telecom equipment exports of Turkey nearly non-existent in exports of Turkey, in 2003, it has reached %4,2 share. Similar developments have occurred in chemicals exports. Other machinery exports have increased its share from %1 to %11,6 between 1980-2003 and as such share of this sector has approached its share in world trade.

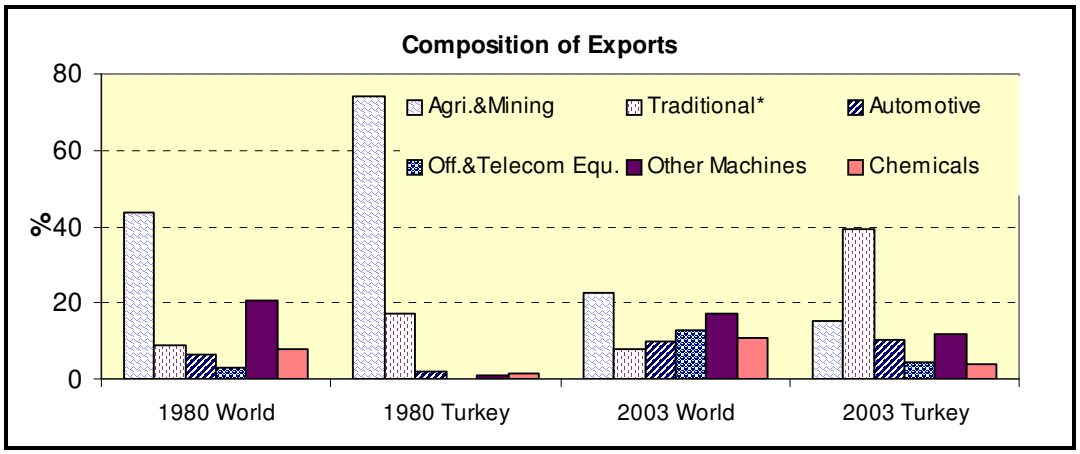

Figure 2-2 Composition of Exports

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.8.

EXPORTS BY COUNTRY GROUPS

Exports by Country Groups ($ Million)							
	1990	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**
EU (25)	7 327	11 722	15 085	16 854	19 468	25 899	34 399
EU (15)	7 177	11 078	14 510	16 118	18 459	24 484	32 538
EFTA	333	294	324	316	409	538	657
CIS	531	2 066	1 649	1 978	2 279	2 963	3 956
RUSSIA		1 238	644	924	1 172	1 368	1 859
NORTH AMERICA	1 032	1 610	3 309	3 297	3 596	3 973	5 174
USA	968	1 514	3 135	3 126	3 356	3 752	4 832
LATIN AMERICA	44	110	239	329	257	215	420
AFRICA	747	1 062	1 373	1 521	1 697	2 131	2 963
MIDDLE EAST	1 527	1 944	2 211	2 892	3 105	4 994	7 238
OTHERS	1 417	2 829	3 586	4 146	5 248	6 540	8 315
TOTAL	**12 959**	**21 637**	**27 775**	**31 334**	**36 059**	**47 253**	**63 121**

Table 2-6 Exports by Country Groups

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.8.

Western Europe is the most important market for Turkish exports. In particular, European Union (EU) members is a country group that has a major share in it. The share of EU in total exports has always been above 50 percent. Exports to the EU (15) were 7.2 billion dollars in 1990 and mounted to 11 billion dollars increasing by 10.9 percent annually during the period from 1990 and 1995. In 2000, exports to EU (15) reached to 14.5 billion dollars, but its share in total exports fell down to 52.2 percent. Although at the end of 2004 exports to EU (15) has reached to 32.5 billion dollars, it's share in total exports decreased to 51.6 percent. In the year 2004 EU has enlarged to include 10 new members; but to these ten members Turkey's exports are not as high yet; these countries have around a total of %3 share in total exports of Turkey.

On the other hand, share of exports to North America (especially USA) in total exports of Turkey increased between 1995-2000, however, after that period, this share has declined up to its 1990 levels. Exports to USA which were 968 million dollars in 1990, increased to 1.5 billion dollars in 1995 and 3.1 billion dollars in 2000. As of 2004, Turkey's exports to USA is 4,8 billion dollars.

Exports by Country Groups Annual % Change						
	95/90*	**00/95**	**2001/2000**	**2002/2001**	**2003/2002**	**2004/2003**
EU (25)	12,0	5,7	11,7	15,5	33,0	32,8
EU (15)	10,9	6,2	11,1	14,5	32,6	32,9
EFTA	-2,4	2,1	-2,5	29,4	31,5	22,1
CIS	57,8	-4,0	20,0	15,2	30,0	33,5
RUSSIA		-9,6	43,5	26,8	16,7	35,9
NORTH AMERICA	11,2	21,1	-0,3	9,1	10,5	30,2
USA	11,3	21,4	-0,3	7,4	11,8	28,8
LATIN AMERICA	29,9	23,2	37,9	-21,8	-16,4	95,2
AFRICA	8,4	5,9	10,7	11,6	25,6	39,0
MIDDLE EAST	5,5	2,7	30,8	7,4	60,8	44,9
OTHERS	19,9	5,3	15,6	26,6	24,6	25,5
TOTAL	**13,4**	**5,7**	**12,8**	**15,1**	**31,0**	**33,6**

Table 2-7 Exports by Country Groups Annual % Change

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.9.

Exports by Country Groups % Share							
	1990	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**
EU (25)	56,5	54,2	54,3	53,8	54,0	54,8	54,6
EU (15)	55,4	51,2	52,2	51,4	51,2	51,8	51,6
EFTA	2,6	1,4	1,2	1,0	1,1	1,1	1,0
CIS	4,1	9,5	5,9	6,3	6,3	6,3	6,3
RUSSIA	0,0	5,7	2,3	2,9	3,3	2,9	2,9
NORTH AMERICA	8,0	7,4	11,9	10,5	10,0	8,4	8,2
USA	7,5	7,0	11,3	10,0	9,3	7,9	7,7
LATIN AMERICA	0,3	0,5	0,9	1,0	0,7	0,5	0,7
AFRICA	5,8	4,9	4,9	4,9	4,7	4,5	4,7
MIDDLE EAST	11,8	9,0	8,0	9,2	8,6	10,6	11,5
OTHERS	10,9	13,1	12,9	13,2	14,6	13,8	13,0
TOTAL	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Table 2-8 Exports by Country Groups % Share

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.10.

With the collapse of Soviet Union, new countries were formed in the region. Turkey's proximity to the region and its ability to sell consumer goods that these countries need, gave an opportunity to Turkey to enhance its exports to these countries (CIS). Until 1998, exports to CIS countries grew every year. But, because of the economic crisis in the Russian Federation in 1998, the total demand of CIS countries was influenced negatively. After that, first, Turkish exports to CIS countries began to decrease and then it remained stagnant until the year 2000. Beginning from 2000, exports to these countries have surged again and in the years 2003 and 2004 it has increased by %30 and %33,5 respectively.

Middle East countries are another important country group for Turkey's exports. Exports to Middle East couldn't have shown a desirable progress in 1990s. Exports to these countries rose from 1.8 billion dollars in 1990 to only 2.2 billion dollars in 2000 and share of the country group in total exports of Turkey has declined from 11,8% to 8%. However, in the last years, especially after Iraq war has ended, exports to Middle East has increased much due to a very large amount of increase of exports to Iraq. As of the year 2004, Turkey's exports to Middle East have reached to 7,2 billion dollars. In parallel with these developments, the share of exports to Middle East in total exports of Turkey has risen to 11.5 percent in 2004.

2.4 Basic Developments in Imports

Sectoral Breakdown of Turkey's Imports by BEC Classification ($ Million)							
	1990	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**
Investment Goods	4 038	8 119	11 346	6 967	8 496	11 475	17 659
Intermediate Goods	16 114	25 035	35 708	29 970	37 443	49 490	67 035
Consumption Goods	2 114	2 456	7 218	4 082	5 004	7 899	12 345
Others	32	95	231	380	610	475	500
Total Imports	**22 298**	**35 705**	**54 503**	**41 399**	**51 554**	**69 340**	**97 540**

Table 2-9 Sectoral Breakdown of Turkey's Imports by BEC Classification

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.11.

Sectoral Breakdown of Turkey's Imports Annual % Change						
	1995/1990	**2000/1995**	**2001/2000**	**2002/2001**	**2003/2002**	**2004/2003**
Investment Goods	20,2	7,9	-38,6	21,9	35,1	53,9
Intermediate Goods	11,1	8,5	-16,1	24,9	32,2	35,2
Consumption Goods	3,2	38,8	-43,4	22,6	57,8	55,0
Others	40,0	28,5	64,3	60,7	-22,2	5,3
Total Imports	**12,0**	**10,5**	**-24,0**	**24,5**	**34,5**	**40,7**

Table 2-10 Sectoral Breakdown of Turkey's Imports Annual % Change

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.11.

Sectoral Shares of Turkey's Imports (%)							
	1990	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**
Investment Goods	18,1	22,7	20,8	16,8	16,5	16,5	18,1
Intermediate Goods	72,3	70,1	65,5	72,4	72,6	71,4	68,8
Consumption Goods	9,5	6,9	13,2	9,9	9,7	11,4	12,6
Others	0,1	0,3	0,4	0,9	1,2	0,7	0,5
Total Imports	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Table 2-11 Sectoral Shares of Turkey's Imports (%)

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.11.

Conventionally, the import of intermediate goods constitutes an important part of total imports, which fluctuates parallel to Turkey's economic growth. In the first half of 1990s, the share of the import of intermediate goods was over 70 percent, and then it diminished to 65,5 percent in 2000. The share of intermediate goods increased in 2001 and was recorded at 72,6 percent in 2002 when economic recovery took place. In the years 2003 and 2004 it has again begun to decrease. As of 2004 share of intermediate goods in exports is 68,8%.

One of the main developments in the second half of 1990s was the increase in the import of consumption goods. Especially, in 3 years period after 1996, the policy implementation of international liabilities arising from the WTO membership and entering the final stage of customs union with European Union, led the import of consumption goods to grow by 38.8 percent in the period of 1995-2000. Related to the pace of economic recovery and rising income levels the imports of consumer goods

increased by 57.8 percent in 2003 and 55 percent in 2004. It can be observed that imports of consumption goods fluctuate more than total imports. During the growth years, positive expectations of consumers determine their consumption demand. In the last 10-15 years, when expectations about the economic condition improve, consumption demand expands.

Between 1995-2002 investment goods imports increased at lower rate compared to total imports, while the trend changed in 2003. In 2003 the rate of increase went slightly above the increase in total imports, but in 2004 capital goods imports enlarged by 53,6 percent while that of total imports was 40,4 percent. The main determinant of this development was the result of the rise of private investments by %54,6 in 2004.

TURKEY'S IMPORTS BY COUNTRY GROUPS

Turkey's Imports by Country Groups ($ Million)							
	1990	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**
EU (25)	10 219	17 255	27 388	18 949	24 519	33 495	45 428
EU (15)	9 898	16 861	26 610	18 280	23 321	31 696	42 347
EFTA	597	892	1 155	1 481	2 512	3 396	3 890
NORTH AMERICA	2 464	4 017	4 167	3 390	3 421	3 741	5 066
USA	2 282	3 724	3 911	3 261	3 099	3 496	4 697
CIS	1 247	3 315	5 693	4 630	5 555	7 777	12 886
RUSSIA		2 082	3 887	3 436	3 892	5 451	9 027
LATIN AMERICA	546	704	620	447	635	1 169	1 470
AFRICA	1 336	1 384	2 714	2 819	2 696	3 338	4 781
MIDDLE EAST	2 513	2 645	3 122	2 811	2 983	4 059	5 139
OTHERS	3 380	5 497	9 643	6 872	9 234	12 365	18 880
TOTAL	**22 302**	**35 709**	**54 503**	**41 399**	**51 554**	**69 340**	**97 540**

Table 2-12 Turkey's Imports by Country Groups ($ Million)

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.12.

European Countries have an important share in Turkey's imports, largely due to their geographical proximity to Turkey and their level of economic development. Among the country groups of Europe, European Union Members are in the first rank.

EU is followed by CIS because of the imports of crude oil and natural gas from that region.

Turkey's Imports by Country Groups Annual % Change						
	95/90	**00/95**	**2001/2000**	**2002/2001**	**2003/2002**	**2004/2003**
EU (25)	13,8	11,7	-30,8	29,4	36,6	35,6
EU (15)	14,1	11,6	-31,3	27,6	35,9	33,6
EFTA	9,9	5,9	28,2	69,6	35,2	14,6
NORTH AMERICA	12,6	0,8	-18,6	0,9	9,4	35,4
USA	12,6	1,0	-16,6	-5,0	12,8	34,4
CIS	33,2	14,4	-18,7	20,0	40,0	65,7
RUSSIA		17,3	-11,6	13,3	40,1	65,6
LATIN AMERICA	5,8	-2,4	-28,0	42,2	84,1	25,7
AFRICA	0,7	19,2	3,8	-4,3	23,8	43,2
MIDDLE EAST	1,1	3,6	-10,0	6,1	36,1	26,6
OTHERS	12,5	15,1	-28,7	34,4	33,9	51,1
TOTAL	12,0	10,5	-24,0	24,5	34,5	40,7

Table 2-13 Turkey's Imports by Country Groups Annual % Change

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.13.

Turkey's Imports by Country Groups % Share							
	1990	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**
EU (25)	45,8	48,3	50,2	45,8	47,6	48,3	46,7
EU (15)	44,4	47,2	48,8	44,2	45,2	45,7	43,5
EFTA	2,7	2,5	2,1	3,6	4,9	4,9	4,0
NORTH AMERICA	11,0	11,2	7,6	8,2	6,6	5,4	5,2
USA	10,2	10,4	7,2	7,9	6,0	5,0	4,8
CIS	5,6	9,3	10,4	11,2	10,8	11,2	13,2
RUSSIA		5,8	7,1	8,3	7,5	7,9	9,3
LATIN AMERICA	2,4	2,0	1,1	1,1	1,2	1,7	1,5
AFRICA	6,0	3,9	5,0	6,8	5,2	4,8	4,9
MIDDLE EAST	11,3	7,4	5,7	6,8	5,8	5,9	5,3
OTHERS	15,2	15,4	17,7	16,6	17,9	17,8	19,2
TOTAL	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Table 2-14 Turkey's Imports by Country Groups % Share

Source: Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006) p.13.

Middle East countries is in the third place in Turkey's imports because of the imports of crude oil, and North America is in the fourth place as a result of the intense trade relationships with the USA.

In brief Turkey's foreign trade has developed much in terms of quantity and quality since 1980s. Export performance is spectacular especially in the last two years, thanks to both domestic developments and international developments. Turkey has been implementing new strategies to make this development sustainable and to diversify her exports and imports more on the regional and sectoral basis. Turkey aims to go beyond 500 billion of exports by the year of 2023[38].

[38] Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006)

3. METHODOLOGY

3.1 Exploring Data Patterns and Choosing a Forecasting Technique

Generally two types of data are of interest to the forecaster. The first are data collected at a single in time. The second are observations of data made over time. When all observations are from the same time period, they are called as cross-sectional data. The objective is to examine such data and then to extrapolate or extend the revealed relationships to the larger population. Any variable that consists of data that are collected, recorded or observed over successive increments of time is called a time series[39]. In this thesis, time series will be studied and tried to estimate how the sequence of observations would continue into the future.

One of the most important aspects in selecting an appropriate forecasting method for time series data is to consider the different types data patterns. "Four types of time series data patterns can be distinguished: horizontal, seasonal, cyclical, and trend.

1. A horizontal pattern exists when the data values fluctuate around a constant mean. This type of series is called stationary in its mean.
2. A seasonal pattern exits when a series is influenced by seasonal factors (e.g., the quarter of the year, the month, or day of the week). Seasonal series are sometimes also called periodic although they do not exactly repeat themselves over each period.
3. A cyclical pattern exists when the data exhibit rises and falls that are not of a fixed period. For economic series, these are usually due to economic fluctuations such as those associated with the business cycle. The major distinction between a seasonal and a cyclical pattern is that the former is of a constant length and recurs on a regular periodic basis, while the latter varies in length. Moreover, the average length of a cycle is usually longer than that of seasonality and the magnitude of a cyclical is usually more variable than that of seasonality.

[39] Hanke and Wichern, p58-59.

4. A trend pattern exists when there is a long-term increase or decrease in the data. The sales of many companies, the gross national product, and many other business or economic indicators follow a trend pattern in their movement over time.

Many data series include combinations of these patterns[40].

On the next page, there are Turkish monthly export and import values tables and associated time series plots which then will be used in forecasting methods in later stages of the thesis. The data were gathered from Turkish Statistical Institute and they include values beginning from January 1996 to May 2006. Those statistical data are based on International Standard Industrial Classification of All Economic Activities ISIC prepared by United Nations and commonly accepted in the entire world[41].

[40] Makridakis et al., *Forecasting: Methods and Applications*, p.25.
[41] Turkish Statitical Institute Classification Server, http://dieweb.die.gov.tr/DIESS/ChangeLocaleAction.do?dil=en (June 2006).

Table 3-1 Turkish Export Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	1752439	2000-01	2123098	2004-01	4619661
1996-02	1779857	2000-02	2263418	2004-02	3664503
1996-03	2009117	2000-03	2316917	2004-03	5218042
1996-04	1827514	2000-04	2438601	2004-04	5072463
1996-05	1623452	2000-05	2338187	2004-05	5170062
1996-06	1746574	2000-06	2325801	2004-06	5284383
1996-07	1914651	2000-07	2288328	2004-07	5632139
1996-08	1942214	2000-08	2044083	2004-08	4707491
1996-09	1896968	2000-09	2403298	2004-09	5656284
1996-10	2102350	2000-10	2244784	2004-10	5867342
1996-11	2229642	2000-11	2499363	2004-11	5733909
1996-12	2399688	2000-12	2489027	2004-12	6540874
1997-01	2044415	2001-01	2236402	2005-01	4997276
1997-02	1857091	2001-02	2515772	2005-02	5651740
1997-03	2176286	2001-03	2546102	2005-03	6591851
1997-04	2026329	2001-04	2616050	2005-04	6128132
1997-05	2191306	2001-05	2884681	2005-05	5977226
1997-06	2131615	2001-06	2561640	2005-06	6038534
1997-07	2150028	2001-07	2483787	2005-07	5763466
1997-08	2138343	2001-08	2579467	2005-08	5552867
1997-09	2223510	2001-09	2595735	2005-09	6814269
1997-10	2389808	2001-10	2812546	2005-10	6772179
1997-11	2523109	2001-11	2841732	2005-11	5942403
1997-12	2409232	2001-12	2660302	2005-12	7245937
1998-01	2193865	2002-01	2607320	2006-01	5097404
1998-02	2063852	2002-02	2383773	2006-02	6012433
1998-03	2477471	2002-03	2918944	2006-03	7380055
1998-04	1917282	2002-04	2742858	2006-04	6373763
1998-05	2417913	2002-05	3000325	2006-05	6837874
1998-06	2261733	2002-06	2770694		
1998-07	2209368	2002-07	3103852		
1998-08	2237388	2002-08	2975889		
1998-09	2208025	2002-09	3218207		
1998-10	2495375	2002-10	3501128		
1998-11	2252603	2002-11	3593605		
1998-12	2239076	2002-12	3242495		
1999-01	1883315	2003-01	3533706		
1999-02	2194475	2003-02	2923460		
1999-03	2402243	2003-03	3908256		
1999-04	1953003	2003-04	3662183		
1999-05	2225595	2003-05	3860471		
1999-06	2122324	2003-06	3796114		
1999-07	2254965	2003-07	4236114		
1999-08	1939837	2003-08	3828726		
1999-09	2273769	2003-09	4114678		
1999-10	2658570	2003-10	4824388		
1999-11	2447752	2003-11	3969697		
1999-12	2231377	2003-12	4595042		

Table 3-2 Turkish Import Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	3154532	2000-01	3229067	2004-01	6329957
1996-02	2860523	2000-02	3931495	2004-02	6139442
1996-03	3742740	2000-03	4164053	2004-03	8451888
1996-04	3663636	2000-04	4491494	2004-04	7932034
1996-05	3899734	2000-05	4698034	2004-05	7990553
1996-06	3421921	2000-06	4964509	2004-06	8467765
1996-07	3913323	2000-07	4677509	2004-07	8728466
1996-08	3521377	2000-08	4879028	2004-08	7883362
1996-09	3319729	2000-09	4643519	2004-09	8486552
1996-10	3604393	2000-10	5024136	2004-10	8087592
1996-11	3943693	2000-11	5362480	2004-11	8568140
1996-12	4581041	2000-12	4437497	2004-12	10474016
1997-01	3613582	2001-01	4071580	2005-01	7219680
1997-02	3100081	2001-02	3594476	2005-02	8323628
1997-03	3831446	2001-03	3108975	2005-03	10196278
1997-04	3503512	2001-04	3037989	2005-04	9595500
1997-05	4319075	2001-05	3558810	2005-05	9811620
1997-06	3872635	2001-06	3298941	2005-06	9946920
1997-07	4133728	2001-07	3436567	2005-07	9596123
1997-08	4158745	2001-08	3502144	2005-08	10272181
1997-09	4357571	2001-09	3424977	2005-09	10365939
1997-10	4373908	2001-10	3364479	2005-10	10089752
1997-11	4353278	2001-11	3559438	2005-11	9673050
1997-12	4941158	2001-12	3440708	2005-12	11682390
1998-01	3105602	2002-01	3432188	2006-01	8139565
1998-02	3875014	2002-02	3038171	2006-02	9796674
1998-03	4363698	2002-03	3938696	2006-03	11583232
1998-04	3633694	2002-04	4212571	2006-04	11562738
1998-05	4174760	2002-05	4304487	2006-05	12205551
1998-06	4167461	2002-06	3936731		
1998-07	4192462	2002-07	4599928		
1998-08	3729410	2002-08	4418817		
1998-09	3659811	2002-09	4509888		
1998-10	3637666	2002-10	4830104		
1998-11	3511683	2002-11	4962305		
1998-12	3870130	2002-12	5369913		
1999-01	2226510	2003-01	4425556		
1999-02	2788102	2003-02	4186023		
1999-03	3045149	2003-03	5755549		
1999-04	3334086	2003-04	5211102		
1999-05	3409307	2003-05	5531855		
1999-06	3586517	2003-06	5727244		
1999-07	3618067	2003-07	6267433		
1999-08	3178335	2003-08	5974767		
1999-09	3643739	2003-09	6205528		
1999-10	3559048	2003-10	6575388		
1999-11	3848185	2003-11	5244963		
1999-12	4434227	2003-12	8234284		

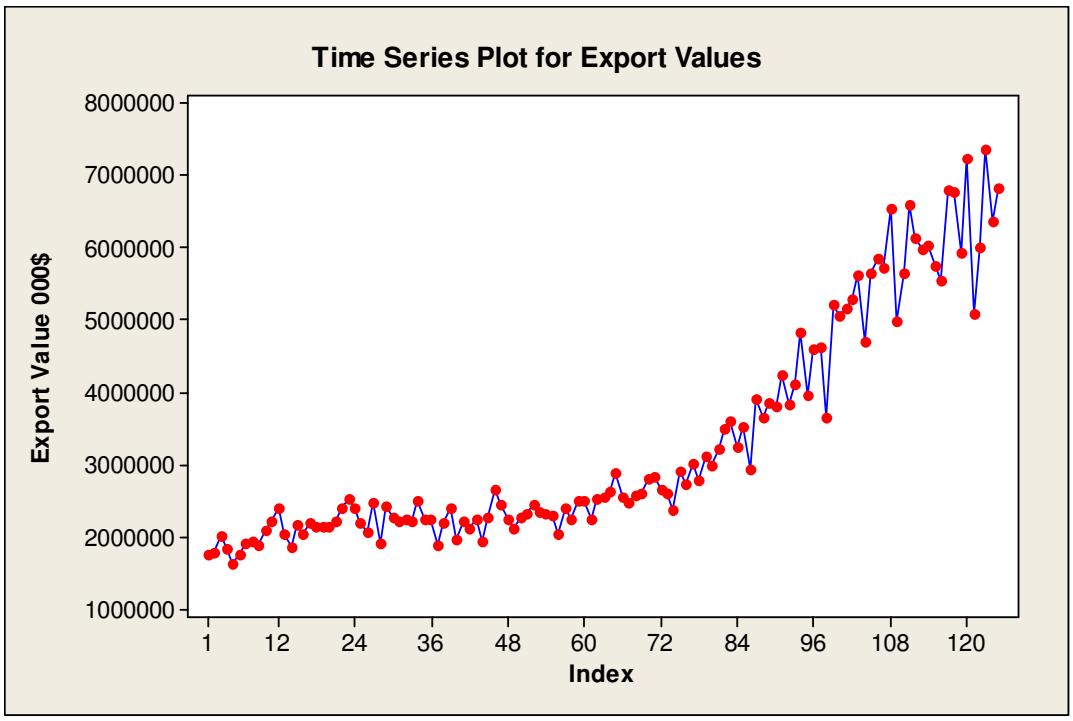

Figure 3-1 Time Series Plot for Export Values

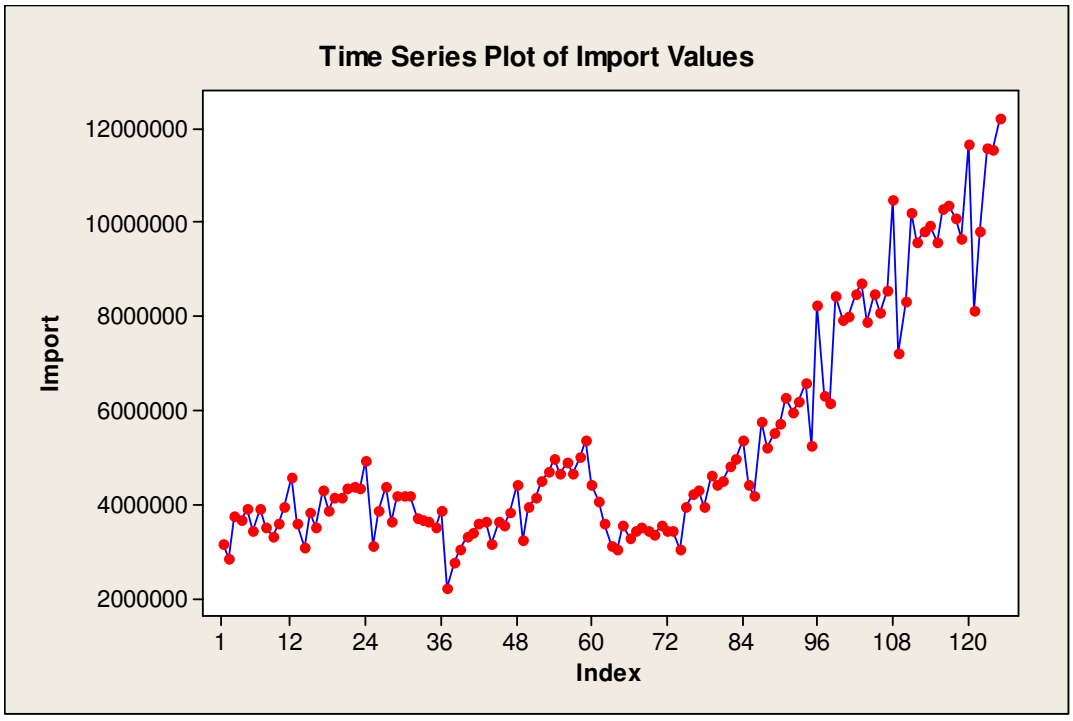

Figure 3-2 Time Series Plot for Import Values

3.2 Exploring Data Patterns with Autocorrelation Analysis

When a variable is measured over time, observations in different time periods are frequently related or correlated. This correlation is measured using the autocorrelation coefficient. Autocorrelation is the correlation between a variable lagged one or more periods and itself. Data patterns, including components such as trend and seasonality, can be studied using autocorrelations. Auto correlation coefficients for different time lags of a variable are used to identify time series patterns[42].

Equation 3.1 contains the formula for computing the lag k autocorrelation coefficient (r_k) between observations Y_t and Y_{t-1}, which are k periods apart.

$$r_k = \frac{\sum_{t=k+1}^{n} (Y_t - \bar{Y})(Y_{t-k} - \bar{Y})}{\sum_{t=k}^{n} (Y_t - \bar{Y})^2} \qquad k = 0,1,2,... \qquad (3.1)$$

where

r_k = autocorrelation coefficient for a lag of k periods

$\bar{Y}$ = mean of the values of the series

Y_t = observation in time period t

Y_{t-k} = observation k time periods earlier or at time period t-k

Figures 3-3 and 3-4 contain a scatter plot of the pairs of observations (Y_{t-1}, Y_t). It is clear from the scatter diagrams that the lag 1 correlations will be positive. Using Minitab, the lag 1 autocorrelation coefficient (r_1), or the autocorrelation between Y_{t-1} and Y_t, is computed as 0,923352 for the export data. This means that the successive monthly export values are correlated with each other. For Turkish imports, the lag 1 autocorrelation coefficient is 0,901966 which means that the successive monthly import values are correlated with each other, too. The lag 2 autocorrelation coefficients (r_2) are

[42] Hanke and Wichern, p.60-61.

less than the autocorrelation coefficients at lag 1. Generally, as the number of lags, *k*, increases the magnitudes of the autocorrelation coefficients decrease.

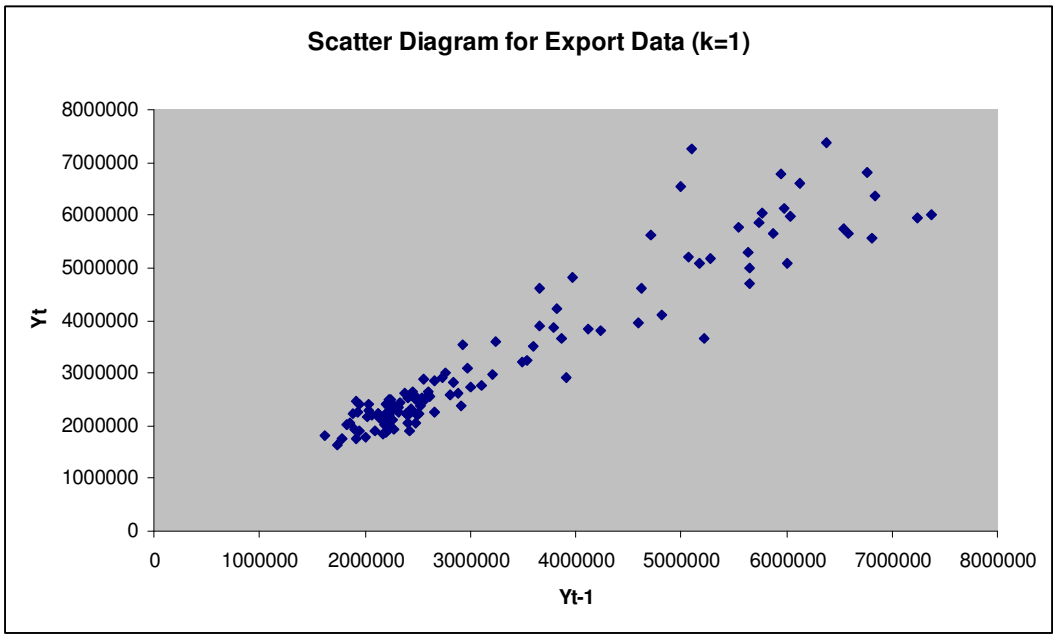

Figure 3-3 Scatter plot of the pairs of observations for the export data with k=1

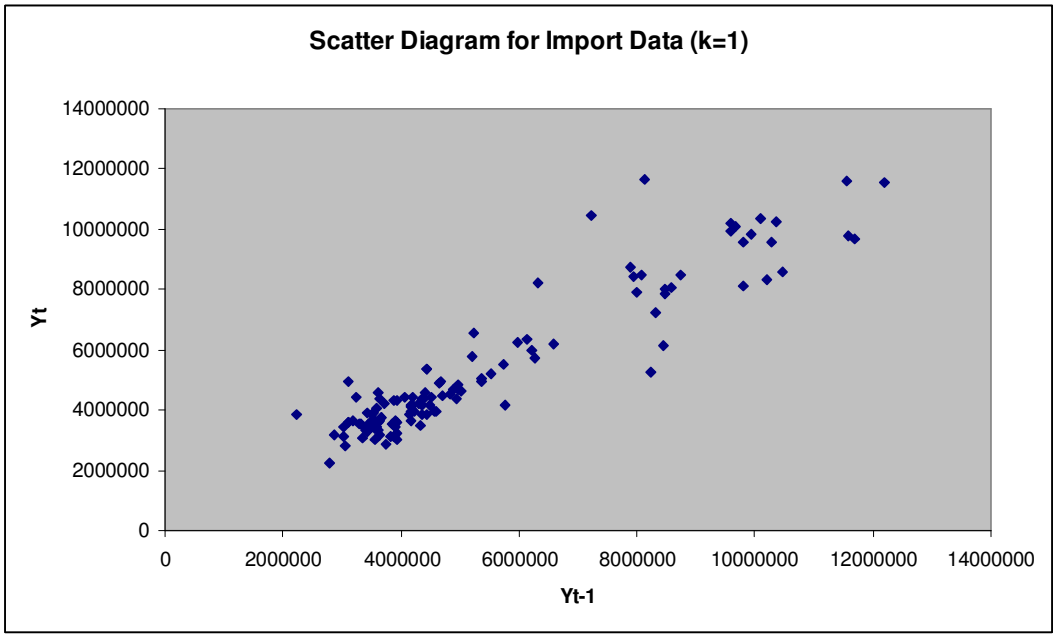

Figure 3-4 Scatter plot of the pairs of observations for the import data with k=1

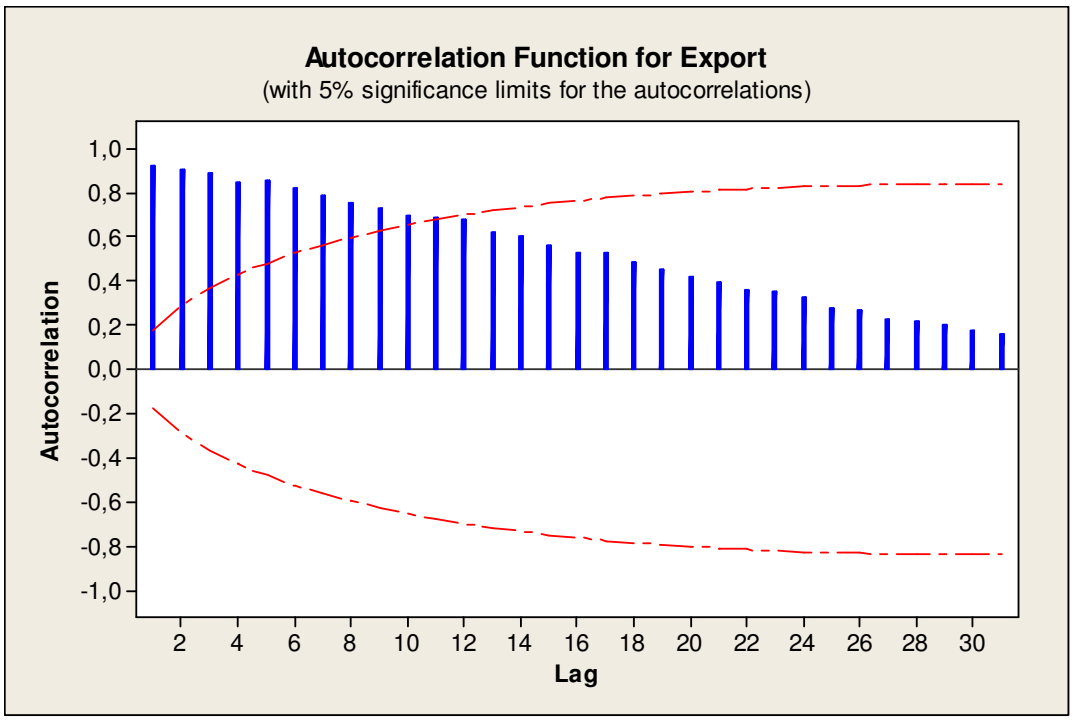

Figure 3-5 Autocorrelation Function for Turkish Export Data

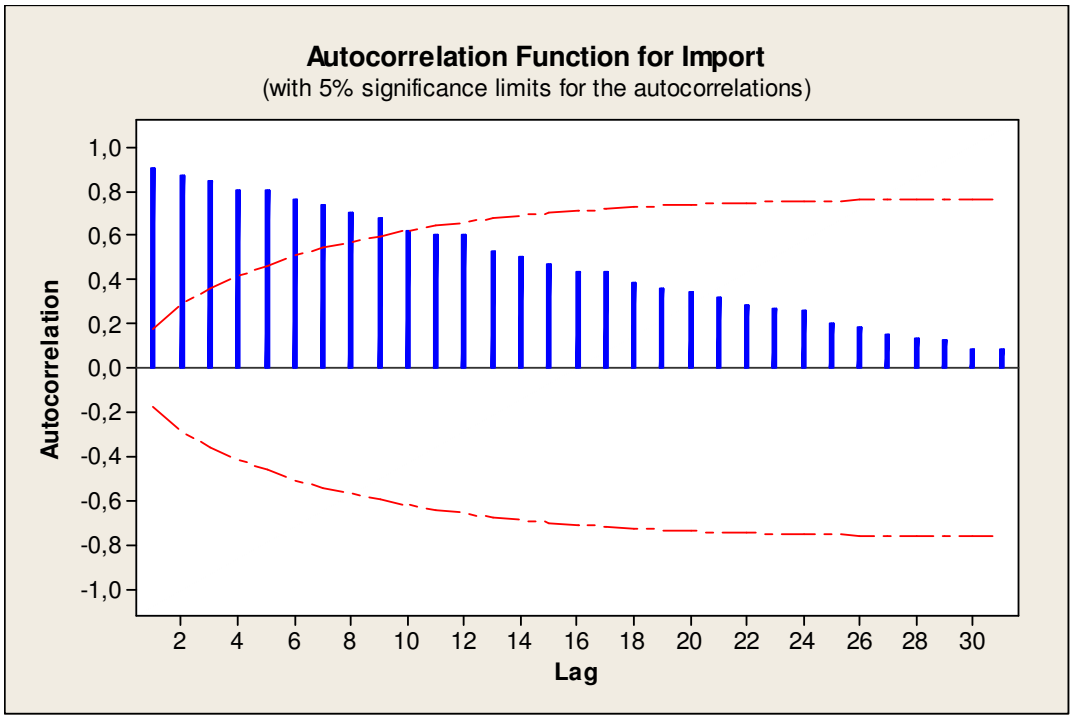

Figure 3-6 Autocorrelation Function for Turkish Import Data

Lag	ACF	T	LBQ	Lag	ACF	T	LBQ
1	0,923352	10,32	109,15	17	0,526340	1,35	1258,84
2	0,905542	6,16	214,99	18	0,486338	1,23	1293,93
3	0,883175	4,74	316,48	19	0,447537	1,12	1323,92
4	0,845704	3,89	410,32	20	0,418917	1,03	1350,46
5	0,852751	3,52	506,52	21	0,389977	0,95	1373,67
6	0,823065	3,10	596,89	22	0,361325	0,88	1393,79
7	0,787918	2,77	680,41	23	0,349276	0,84	1412,78
8	0,752033	2,49	757,15	24	0,322982	0,78	1429,18
9	0,726825	2,30	829,44	25	0,279775	0,67	1441,60
10	0,696132	2,11	896,34	26	0,264083	0,63	1452,78
11	0,683598	2,00	961,41	27	0,226169	0,54	1461,07
12	0,677362	1,92	1025,87	28	0,215051	0,51	1468,64
13	0,619089	1,71	1080,20	29	0,201865	0,48	1475,38
14	0,598431	1,62	1131,41	30	0,174772	0,41	1480,48
15	0,563071	1,49	1177,17	31	0,157510	0,37	1484,67
16	0,530220	1,38	1218,11				

Table 3-3 Autocorrelation Function: Export

Lag	ACF	T	LBQ		Lag	ACF	T	LBQ
1	0,901966	100,843	104,15		17	0,435772	12,029	1062,60
2	0,865241	59,684	200,78		18	0,385783	10,528	1084,68
3	0,844525	46,493	293,58		19	0,358725	0,9704	1103,95
4	0,805807	38,239	378,77		20	0,338968	0,9101	1121,32
5	0,804615	34,373	464,42		21	0,318737	0,8502	1136,83
6	0,762876	29,887	542,06		22	0,283394	0,7516	1149,21
7	0,734135	26,903	614,57		23	0,271009	0,7155	1160,64
8	0,700896	24,315	681,22		24	0,258246	0,6790	1171,12
9	0,678453	22,497	744,21		25	0,204031	0,5345	1177,73
10	0,622225	19,844	797,66		26	0,184742	0,4829	1183,20
11	0,604023	18,684	848,47		27	0,149660	0,3905	1186,83
12	0,604209	18,189	899,75		28	0,134661	0,3509	1189,80
13	0,527420	15,473	939,18		29	0,124898	0,3251	1192,38
14	0,502135	14,457	975,24		30	0,084104	0,2188	1193,56
15	0,468598	13,271	1006,93		31	0,081798	0,2127	1194,69
16	0,436536	12,193	1034,69					

Table 3-4 Autocorrelation Function: Import

Figures 3-5 and 3-6 show a plot of the autocorrelations versus time lags for Turkish export and import values. The horizontal scale on the bottom of the graph shows each time lag of interest, 1,2,3, and so on. The vertical scale on the left shows the possible range of an autocorrelation coefficient, -1 to +1. The horizontal line in the

middle of the graph represents autocorrelations of zero. The vertical lines that extend upward above time lags show autocorrelation coefficients.

The data patterns, including trend and seasonality can be studied via the figures 3-5 and 3-6. Autocorrelation coefficients for different time lags for a variable can be used to answer the following questions about a time series:

1. Are the data random?
2. Do the data have a trend (nonstationary)?
3. Are the data stationary?
4. Are the data seasonal?

3.2.1 Randomness of the Data

If a series is random, the autocorrelation between Y_{t-1} and Y_t for any lag k are close to zero. The successive values of a time series are not related to each other. Autocorrelations for Turkish export and import data which are shown in figures 3-5 and 3-6 reveal that time series for export and import data are not random. The autocorrelation coefficients of random data have a sampling distribution that can be approximated by a normal curve with mean zero and an approximate standard deviation of $1/\sqrt{n}$. The sample autocorrelation coefficients can be compared with theoretical sampling distribution and it can be determined whether, for given time lags, they come from a population whose mean is zero. Some software packages use a slightly different formula as shown in equation 3.2 to compute the standard deviations (or standard errors) of the autocorrelation coefficients.

$$SE(r_k) = \sqrt{\frac{1 + 2\sum_{i=1}^{k-1} r_i^2}{n}} \qquad (3.2)$$

where

$SE(r_k)$ = standard error of the autocorrelation at lag k

r_i = autocorrelation at lag i

k = the time lag

n = number of observations in the time series.

This formula assumes any autocorrelation before lag k is different from zero and any autocorrelation at lags greater than or equal to k is zero. For an autocorrelation at lag 1, the standard error $1/\sqrt{n}$ is used. If the series is truly random, almost all of the sample autocorrelation coefficients should lie within a range specified by zero, plus or minus a certain number of standard errors. At a specified confidence level, a series can be considered random if the calculated autocorrelation coefficients are each within the interval about 0 given by:

$$0 \pm t \times SE(r_k)$$

where the multiplier t is an appropriate percentage point of a t distribution.

Although testing each of the r_k to see if they are individually significantly different from 0 is useful, it is also good practice to examine a set of consecutive r_k's as a group. It can be used a portmanteau test to see whether the set, say, of the first 10 r_k values is significantly different from a set in which all 10 values are zero.

One common portmanteau test is the modified Box-Pierce Q statistic (Equation 3.3) developed by Ljung and Box. This test is usually applied to the residuals of a forecast model. If the autocorrelations are computed from a random (white nose) process, the statistic Q has a chi-square distribution with m (the number of time lags to be tested) degrees of freedom. For the residuals of a forecast model, however, the statistic Q has a chi-square distribution with the degrees of freedom equal to m minus the number of parameters estimated in the model. The value of the Q statistic can be compared with the chi-square table to determine if it is larger than we would expect it to be under the null hypothesis that all the autocorrelations in the set are zero.

Alternatively, the *p*-value generated by the test statistic *Q* can be computed and interpreted. The *Q* statistic is given in Equation 3.3.

$$Q = n(n+2)\sum_{k=1}^{m}\frac{r_k^2}{n-k} \qquad (3.3)$$

where

n = the number of observations in the time series

k = the time lag

m = the number of time lags to be tested

r_k = sample autocorrelation function of the residuals lagged k time periods

Equation 3.4 is a simple random model often called a white noise model. Observation Y_t is composed of two parts: c, the overall level, and ε_t, which is the random error component. It is important to note that the ε_t component is assumed to be uncorrelated from period to period[43].

$$Y_t = c + \varepsilon_t \qquad (3.4)$$

Now it can be checked whether Turkish export data are consistent with this model. A hypothesis test is developed to determine whether a particular autocorrelation coefficient is significantly different from zero for the correlogram shown in figure 3-3. The null and alternative hypotheses for testing the significance of the lag 1 population autocorrelation coefficient are

$$H_0 : \rho_1 = 0$$
$$H_1 : \rho_1 \neq 0$$

If the null hypothesis is true, the test statistic

$$t = \frac{r_1 - \rho_1}{SE(r_1)} = \frac{r_1 - 0}{SE(r_1)} = \frac{r_1}{SE(r_1)} \qquad (3.5)$$

[43] Hanke and Wichern, p.65-67.

has a t distribution with $df = n-1$. Here $n-1=125-1=124$, so far a 5% significance level, the decision rule is:

If $t<-1.96$ or $t>1.96$, H_0 is rejected and it is concluded the lag 1 autocorrelation is significantly different from zero.

The critical values ± 1.96 are the upper and lower 0.025 points of a t distribution with degrees of freedom greater than 29. The standard error of r_1 is $SE(r_1)=\sqrt{1/125}=0.0894$ and the value of the test statistic becomes

$$t=\frac{r_1}{SE(r_1)}=\frac{0.923352}{0.0894}=10.3234$$

Since $t=10.3234>1.96$ we reject H_0 and conclude that the lag autocorrelation is significantly different from zero. This result agrees with the T value for lag 1 in the Minitab output in Table 3-3.

To test for 0 autocorrelation at time lag 2, it is considered

$$H_0:\rho_2=0$$
$$H_1:\rho_2\neq 0$$

and the test statistic

$$t=\frac{r_2-\rho_2}{SE(r_2)}=\frac{r_2-0}{SE(r_2)}=\frac{r_2}{SE(r_2)}$$

Using equation (3.2)

$$SE(r_k)=\sqrt{\frac{1+2\sum_{i=1}^{k-1}r_i^2}{n}}=\sqrt{\frac{1+2\sum_{i=1}^{2-1}r_i^2}{n}}=\sqrt{\frac{1+2(0,923352)^2}{125}}=\sqrt{0.02164}=0.14711$$

and

$$t = \frac{0{,}905542}{0.14821} = 6.1556$$

This result agrees with the T value for lag 2 in the Minitab output in Table 3-3. Since $t = 6.1556 > 1.96$ we reject H_0 and conclude that the lag autocorrelation is significantly different from zero. The 95% confidence limits are shown in figure 3-5 by the dashed lines in the graphical display of the autocorrelation function. Also, from figure 3-5, the value of Q (LBQ) for several time lags can be seen, if the LBQ values are compared with the corresponding the upper 0.05 point of a chi-square distribution with appropriate degrees of freedom, it can be seen that all initial LBQ values are greater than the chi-square values. The null hypothesis can be rejected at the 5% significance level. These export data are correlated. The same interpretation is true for Turkish import data, too.

3.2.2 Trend Property and Seasonality of the Data

If a series has trend, successive observations are highly correlated, and the autocorrelation coefficients are typically significantly different from zero for the first several time lags and then gradually drop toward zero as the lags increases. A stationary time series is one whose basic statistical properties, such as the mean and variance, remain constant over time. Consequently, a series that varies about a fixed level (no growth or decline) over time is said to be stationary. A series that that contains a trend is said to be nonstationary. The autocorrelation coefficients for a stationary series decline to zero fairly rapidly, generally after the second or third time lag. On the other hand, sample autocorrelations remain fairly large for a nonstationary series for several time periods[44]. The autocorrelation for time lag 1 is often very large (close to 1), which is 0,923352 for Turkish export data and 0,901966 for Turkish import data. The autocorrelation coefficient for time lag 2 will also be large, which is 0,905542 for Turkish export data and 0,865241 for Turkish import data. However, it will not be as large as for time lag 1, which is also the case for Turkish export and import data.

[44] Hanke and Wichern, p.67-69.

If a series has a seasonal pattern, a significant autocorrelation coefficient will occur at the seasonal time lag or multiples of the seasonal lag. For the Turkish export and import data, there are no significant seasonal patterns.

3.3 Measuring Forecasting Error

Because quantitative forecasting techniques frequently involve time series data, a mathematical notation is developed to refer to each specific time period. The letter *Y* will be used to denote a time series variable unless there is more than one variable involved. The time period associated with an observation is shown as subscript. Thus Y_t refers to the value of the time series at time period *t*.

Mathematical notation must also be developed for distinguishing between an actual value of time series and the forecast value. A ^ (hat) will be placed above a value to indicate that it is being forecast. The forecast value for Y_t is $\hat{Y}_t$. The accuracy of a forecasting technique is frequently judged by comparing the original series Y_1, Y_2, … with the series of forecast values $\hat{Y}_1$, $\hat{Y}_2$,….

Basic forecasting notation is summarized as follows.

Y_t = value of a time series at period *t*

$\hat{Y}_t$ = forecast value of Y_t

$e_t = Y_t - \hat{Y}_t$ = residual, or forecast error

Several methods have been devised to summarize the errors generated by a particular forecasting technique. Most of these measures involve averaging some function of the difference between an actual value and its forecast value. These differences between observed values and forecast values are often referred to as *residuals*.

Equation 3.6 is used to compute the error, or residual, for each forecast period.

$$e_t = Y_t - \hat{Y}_t \qquad (3.6)$$

where

e_t = forecast error in time period t

Y_t = actual value in time period t

$\hat{Y}_t$ = forecast value for time period t

One method for evaluating a forecasting technique uses the sum of the absolute errors. The mean absolute deviation (*MAD*) measures forecast accuracy by averaging the magnitudes of the forecast errors (absolute values of each error). *MAD* is most useful when the analyst wants to measure forecast error in the same units as the original series. Equation 3.7 shows how *MAD* is computed.

$$MAD = \frac{1}{n}\sum_{t=1}^{n}\left|Y_t - \hat{Y}_t\right| \qquad (3.7)$$

The mean squared error (*MSE)* is another method for evaluating a forecasting technique. Each error or residual is squared; these are then summed and divided by the number of observations. This approach penalizes large forecasting errors because the errors are squared, which is imported; a technique that produces moderate errors may well be preferable to one that usually has small errors but occasionally yields extremely large ones. The *MSE* is given by Equation 3.8.

$$MSE = \frac{1}{n}\sum_{t=1}^{n}(Y_t - \hat{Y}_t)^2 \qquad (3.8)$$

Sometimes it is more useful to compute the forecasting errors in terms of percentages rather than amounts. The mean absolute percentage error (*MAPE*) is computed by finding the absolute error in each period, dividing this by the actual observed value for that period, and then averaging these absolute percentage errors. This approach is useful when the size or magnitude of the forecast variable is important in evaluating the accuracy of the forecast. *MAPE* provides an indication of how large

the forecast errors are in comparison to the actual values of the series. The technique is especially useful when the Y_t values are large. *MAPE* can also be used to compare the accuracy of the same or different techniques on two entirely different series. Equation 3.9 shows how *MAPE* is computed[45].

$$MAPE = \frac{1}{n}\sum_{t=1}^{n}\frac{\left|Y_t - \hat{Y}_t\right|}{Y_t} \qquad (3.9)$$

A disadvantage of the MAPE is that it is relevant only for ratio-scaled data (i.e., data with a meaningful zero). Another disadvantage of the MAPE is that it puts a heavier penalty on forecasts that exceed the actual than on those that are less than the actual. For example, the MAPE is bounded on the low side by an error of 100%, but there is no bound on the high side[46].

Sometimes it is necessary to determine whether a forecasting method is biased (consistently forecasting low or high). The mean percentage error (*MPE*) is used in these cases. It is computed by finding the error in each period, dividing this by the actual value for that period, and then averaging these percentage errors. If the forecasting approach is unbiased, *MPE* will produce a number that is close to zero. If the result is a large negative percentage, the forecasting method is consistently overestimating. If the result is a large positive percentage, the forecasting method is consistently underestimating. *MPE* is given by

$$MPE = \frac{1}{n}\sum_{t=1}^{n}\frac{(Y_t - \hat{Y}_t)}{Y_t} \qquad (3.10)$$

Part of the decision to use a particular forecasting technique involves the determination of whether the technique will produce forecast errors that are judged to be sufficiently small. It is certainly realistic to expect a good forecasting technique to

[45] Hanke and Wichern, p.78-81.
[46] J. Scott Armstrong and Fred Collopy, "Error Measures For Generalizing About Forecasting Methods: Empirical Comparisons", **International Journal of Forecasting**, 8 (1992), p. 69-80.

produce relatively small forecast errors on a consistent basis[47]. What matters most to a forecaster and to business is forecast error (or accuracy), because all the business decisions are based on forecasts. The more accurate the forecast, the better will be the business decisions. But, it is humanly impossible to forecast 100% accurately every time[48].

The four measures of forecast accuracy just described are used

- To compare the accuracy of two (or more) different techniques
- To measure a particular technique's usefulness or reliability
- To help search for an optimal technique[49].

3.4 Moving Averages and Smoothing Methods

There are three simple approaches to forecasting a time series: naïve, averaging, and smoothing. Naïve methods are used to develop simple models that assume that very recent data provide the best predictors of the future. Averaging methods generate forecast based on an average of past observations. Smoothing methods produce forecasts, by averaging past values of a series with a decreasing series of weights.

A good strategy for evaluating forecasting methods involves the following steps:

1. A forecasting method is selected based on the analysis of the nature of the data.
2. The data set is divided into two sections - an initialization, or fitting, section and a test, or forecasting, section
3. The selected forecasting technique is used to develop fitted values for the initialization part of the data.

[47] Hanke and Wichern, p.78-81.
[48] Chaman L Jain, " Benchmarking Forecasting Errors", **The Journal of Business Forecasting;** Winter 2005/2006; 24, 4; ABI/INFORM Global pg. 13
[49] Hanke and Wichern, p.78-81.

4. The technique is used to forecast the test part of the data, and the forecasting error is determined and evaluated.
5. A decision is made. The decision might be to use the technique in its present form, to modify the technique, or to develop a forecast using another technique and compare the results[50].

3.4.1 Naïve Model

Naïve forecasts assume that recent periods are the best predictors of the future. The simplest model is

$$\hat{Y}_{t+1} = Y_t \quad (3.11)$$

where $\hat{Y}_{t+1}$ is the forecast made at time t (the forecast origin) for time $t+1$. The naïve forecast for each period is the immediately preceding observation. One hundred percent of the weight is given to the current value of the series. The naïve forecast is sometimes called the "no change" forecast.

Since the naïve forecast (Equation 3.11) discards all other observations, this schema tracks changes very rapidly. The problem with this approach is that random fluctuations are tracked as faithfully as other fundamental changes. Naïve methods are used as the basis for making comparisons against which the performance of more sophisticated methods are judged[51].

Naïve rules are simple but potentially effective time-series forecasting techniques. They are rules in the sense that they are pre-specified so that no parameter values need be estimated. The naïveté is implicit in the fact that the basis for any naïve forecast of a time series is the time series itself. The series is used to predict itself, that is, historical values of the series are used to compose or construct future values of the same series. The technique of naïve forecasting is therefore extrapolation.

Naïve rules, in their simplicity, are relatively low-cost approaches to forecasting, but if a method is effective one should not hesitate to employ it because of

[50] Hanke and Wichern, p.101.
[51] Hanke and Wichern, p. 102-104.

its simplicity or naïveté. Naïve rules are more effective at short-term than at long-term forecasting. As the forecasting span or gap is lengthened, the less accurate is the naïve forecast likely to be, and the greater the attendant risk in basing decisions upon such forecasts[52].

In Table 3-5 below, naïve model and associated forecasting errors for export data were calculated by using Microsoft Excel. In figures 3-7 and 3-8, there are Minitab outputs. Using moving average procedure with a moving average of length one gives naïve forecasting in Minitab Software.

Date	t	Y_t	$\hat{Y}_t$	e_t	$\lvert e_t \rvert$	e_t^2	$\lvert e_t \rvert / Y_t$	e_t / Y_t
1996-01	1	1752439						
1996-02	2	1779857	1752439	27417	27417	751718977	0.0154	0.0154
1996-03	3	2009117	1779857	229260	229260	52560357602	0.1141	0.1141
1996-04	4	1827514	2009117	-181603	181603	32979745859	0.0994	-0.0994
1996-05	5	1623452	1827514	-204062	204062	41641310863	0.1257	-0.1257
1996-06	6	1746574	1623452	123123	123123	15159177832	0.0705	0.0705
…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…
2005-10	118	6772179	6814269	-42090	42090	1771599415	0.0062	-0.0062
2005-11	119	5942403	6772179	-829776	829776	688527524781	0.1396	-0.1396
2005-12	120	7245937	5942403	1303534	1303534	1699202033659	0.1799	0.1799
2006-01	121	5097404	7245937	-2148533	2148533	4616195646301	0.4215	-0.4215
2006-02	122	6012433	5097404	915029	915029	837277959207	0.1522	0.1522
2006-03	123	7380055	6012433	1367622	1367622	1870389300307	0.1853	0.1853
2006-04	124	6373763	7380055	-1006291	1006291	1012622484356	0.1579	-0.1579
2006-05	125	6837874	6373763	464111	464111	215398917288	0.0679	0.0679
			TOTALS		41163751	30427893230184	11.6235	0.4836
					MAD	**MSE**	**MAPE**	**MPE**
					331965.7350	245386235727	0.0937	0.0039

Table 3-5 Naïve Model and associated forecasting errors for Export Data

[52] Richard A. Stanford, "Time Series Forecasting Rules", *Economic Forecasting*, http://facweb.furman.edu/~dstanford/forecast/h3.htm (June, 2006).

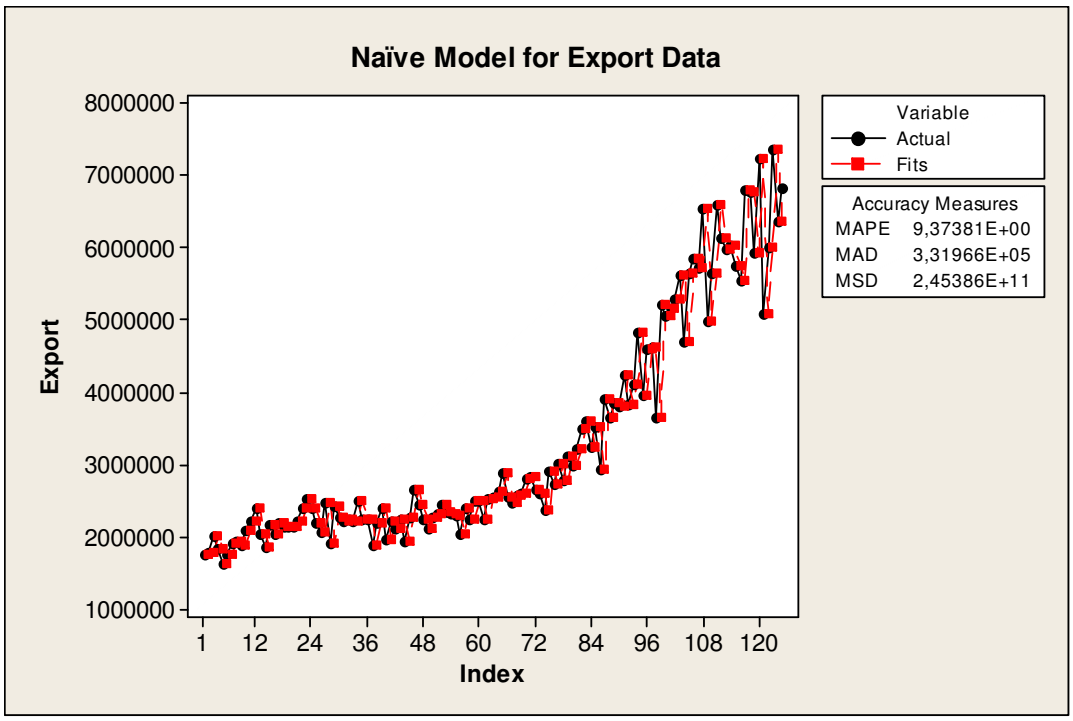

Figure 3-7 Naïve Model for Export Data

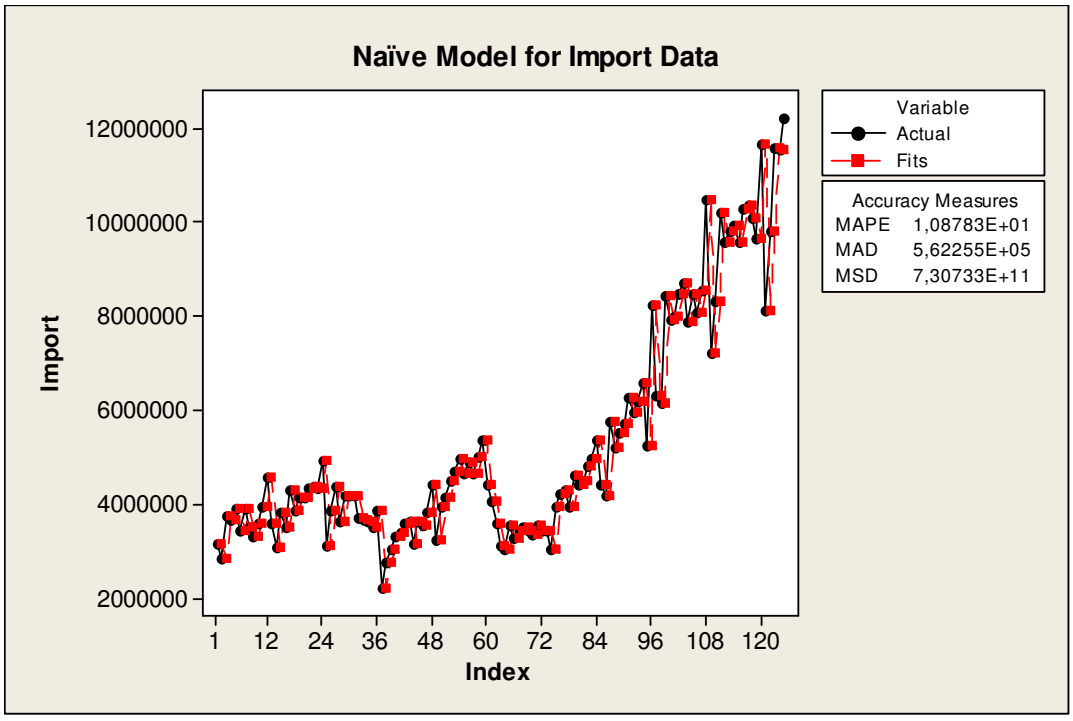

Figure 3-8 Naïve Model for Import Data

3.4.2 Forecasting Methods Based on Averaging

These types of techniques use a form of weighted average of past observations to smooth short-term fluctuations. The assumption underlying these techniques is that the fluctuations in past values represent random departures from some underlying structure. Once this structure is identified, it can be projected into the future to produce a forecast.

3.4.2.1 Simple Averages

Historical data can be smoothed in many ways. The objective is to use past data to develop a forecasting model for future periods. As with the naïve methods, a decision is made to use the first t data points as the initialization part and the remaining data as a test part. Next, Equation 3.12 is used to average (compute the mean of) the initialization part of the data and to forecast the next period.

$$\hat{Y}_{t+1} = \frac{1}{t}\sum_{i=1}^{t} Y_i \qquad (3.12)$$

When a new observation becomes available, the forecast for the next period, $\hat{Y}_{t+2}$, is the average, or mean, computed using Equation 3.12 and this new observation.

When forecasting a large number of series simultaneously data storage may be an issue. Equation 3.13 solves this potential problem. Only the most recent forecast and the most recent observation need to be stored as time moves forward.

$$\hat{Y}_{t+2} = \frac{t\hat{Y}_{t+1} + Y_{t+1}}{t+1} \qquad (3.13)$$

The method of simple averages is an appropriate technique when the forces generating the series to be forecast have stabilized, and the environment in which the series exists is generally unchanging[53].

Date	t	Y_t	$\hat{Y}_t$	e_t	$\lvert e_t \rvert$	e_t^2	$\lvert e_t \rvert / Y_t$	e_t / Y_t
1996-01	1	1752439						
1996-02	2	1779857	1752439	27417	27417	751718977	0.0154	0.0154
1996-03	3	2009117	1766148	242969	242969	59034034578	0.1209	0.1209
1996-04	4	1827514	1847138	-19624	19624	385093330	0.0107	-0.0107
1996-05	5	1623452	1842232	-218780	218780	47864632939	0.1348	-0.1348
1996-06	6	1746574	1798476	-51901	51901	2693743447	0.0297	-0.0297
…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…
2005-10	118	6772179	3095302	3676877	3676877	13519424959105	0.5429	0.5429
2005-11	119	5942403	3126461	2815942	2815942	7929526553663	0.4739	0.4739
2005-12	120	7245937	3150125	4095813	4095813	16775680600103	0.5653	0.5653
2006-01	121	5097404	3184257	1913147	1913147	3660133075747	0.3753	0.3753
2006-02	122	6012433	3200068	2812365	2812365	7909398185797	0.4678	0.4678
2006-03	123	7380055	3223120	4156935	4156935	17280107129212	0.5633	0.5633
2006-04	124	6373763	3256916	3116847	3116847	9714736185807	0.4890	0.4890
2006-05	125	6837874	3282052	3555822	3555822	12643871372626	0.5200	0.5200
			TOTALS		126721087	298376038464147	28.3306	26.9402
					MAD	**MSE**	**MAPE**	**MPE**
					1021944.2491	2406258374711	0.2285	0.2173

Table 3-6 Simple Averages Model for Export Data

[53] Hanke and Wichern, p. 105-106.

Date	t	Y_t	$\hat{Y}_t$	e_t	$\lvert e_t \rvert$	e_t^2	$\lvert e_t \rvert / Y_t$	e_t / Y_t
1996-01	1	3154532						
1996-02	2	2860523	3154532	-294010	294010	86441617255	0.1028	-0.1028
1996-03	3	3742740	3007528	735212	735212	540537153274	0.1964	0.1964
1996-04	4	3663636	3252598	411038	411038	168952394187	0.1122	0.1122
1996-05	5	3899734	3355358	544376	544376	296345770486	0.1396	0.1396
1996-06	6	3421921	3464233	-42312	42312	1790330088	0.0124	-0.0124
…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…
2005-10	118	10089752	4943941	5145811	5145811	26479374693005	0.5100	0.5100
2005-11	119	9673050	4987549	4685500	4685500	21953913985932	0.4844	0.4844
2005-12	120	11682390	5026923	6655467	6655467	44295236259240	0.5697	0.5697
2006-01	121	8139565	5082385	3057179	3057179	9346345093198	0.3756	0.3756
2006-02	122	9796674	5107651	4689023	4689023	21986936106657	0.4786	0.4786
2006-03	123	11583232	5146086	6437146	6437146	41436844184635	0.5557	0.5557
2006-04	124	11562738	5198420	6364318	6364318	40504543332131	0.5504	0.5504
2006-05	125	12205551	5249746	6955806	6955806	48383234905543	0.5699	0.5699
			TOTALS		197277336	736017995382253	28.6488	19.0419
					MAD	**MSE**	**MAPE**	**MPE**
					1590946.2617	5935628995018	0.2310	0.1536

Table 3-7 Simple Averages Model for Import Data

3.4.2.2 Moving Averages

The method of simple averages uses the mean of all the data to forecast. If the analyst is more concerned with recent observations, a constant number of data points can be specified at the outset and a mean computed for the most recent observations. The term *moving average* is used to describe this approach. As each new observation becomes available, a new mean is computed by adding the newest value and dropping the oldest. This moving average is then used to forecast the next period. Equation 3.14 gives the simple moving average forecast. A moving average of order k, MA(k), is computed by

$$\hat{Y}_{t+1} = \frac{Y_t + Y_{t-1} + \ldots + Y_{t-k+1}}{k} \qquad (3.14)$$

where

$\hat{Y}_{t+1}$ = forecast value for next period

Y_t = actual value at period t

k = number of terms in the moving average

The moving average for time period t is the arithmetic mean of the k most recent observations. In a moving average, equal weights are assigned to each observation. Each new data point is included in the average as it becomes available, and the earliest data point discarded. The rate of response to changes in the underlying data pattern depends on the number of periods, k, included in the moving average.

The moving average technique deals only with the latest k periods of known data: the number of data points in each average does not change as time advances. The moving average model does handle trend or seasonality very well, although it does better than simple average method.

The analyst must choose the number of periods, *k*, in a moving average. A moving average of order 1, MA(1), would use the current observation, Y_t, to forecast Y for the next period. This is simply the naïve forecasting approach of Equation 3.11.

The analyst must use judgment when determining how many days, weeks, months, or quarters on which to base the moving average. The smaller the number, the more weight is given to recent periods. Conversely, the greater the number, the less weight is given to more recent periods. A small number is most desirable when there are sudden shifts in the level of the series. A small number places heavy weight on recent history, which enables the forecasts to catch up more rapidly to the current level. A large number is desirable when there are wide, infrequent fluctuations in the series.

Moving averages are frequently used with quarterly or monthly data to help smooth the components within a time series. For quarterly data, a four-quarter moving average, MA(4), yields an average of the four quarters, and for monthly data, a 12-month moving average, MA(12), eliminates or averages out seasonal effects. The larger the order of the moving average, the greater the smoothing effect[54].

[54] Hanke and Wichern, p.107-110.

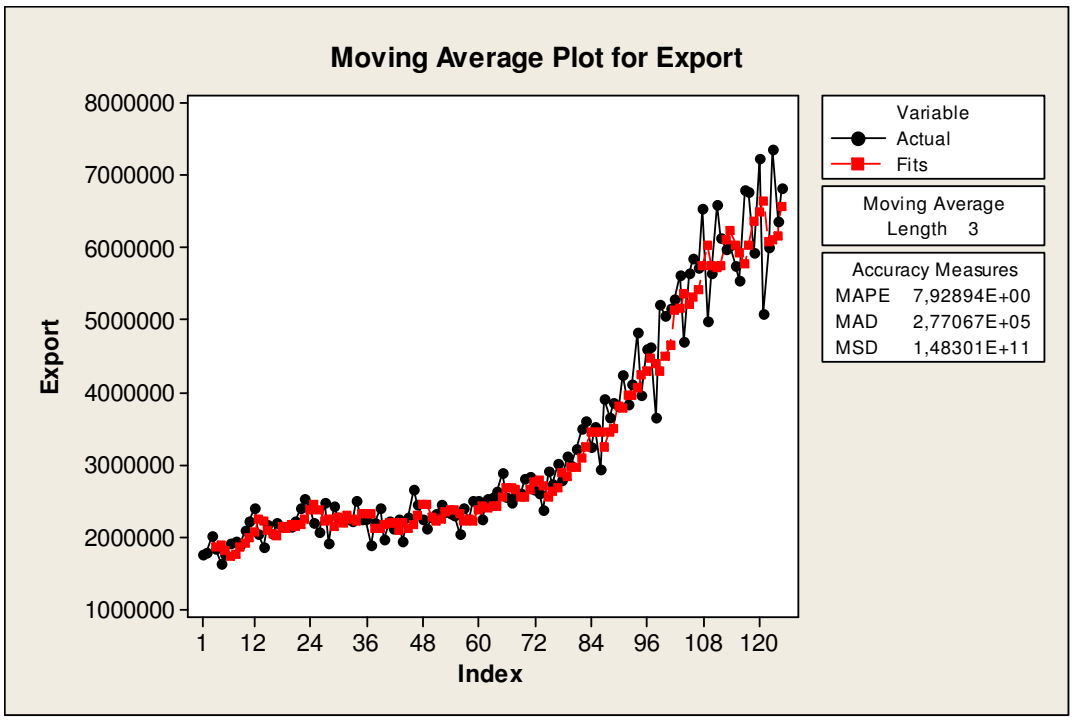

Figure 3-9 Moving Average Method (MA=3) for Export Data

Date	t	Y_t	$\hat{Y}_t$	e_t	$\lvert e_t \rvert$	e_t^2	$\lvert e_t \rvert / Y_t$	e_t / Y_t
1996-01	1	1752439						
1996-02	2	1779857						
1996-03	3	2009117						
1996-04	4	1827514	1847138	-19624	19624	385093330	0.0107	-0.0107
1996-05	5	1623452	1872162	-248711	248711	61857021082	0.1532	-0.1532
1996-06	6	1746574	1820028	-73453	73453	5395366714	0.0421	-0.0421
…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…
2005-11	119	5942403	6379772	-437369	437369	191291285268	0.0736	-0.0736
2005-12	120	7245937	6509617	736321	736321	542168011749	0.1016	0.1016
2006-01	121	5097404	6653506	-1556102	1556102	2421454287148	0.3053	-0.3053
2006-02	122	6012433	6095248	-82815	82815	6858351057	0.0138	-0.0138
2006-03	123	7380055	6118591	1261463	1261463	1591289582400	0.1709	0.1709
2006-04	124	6373763	6163297	210466	210466	44295954274	0.0330	0.0330
2006-05	125	6837874	6588750	249124	249124	62062689815	0.0364	0.0364
			TOTALS		33802223	18092761831273	9.6733	1.6827
					MAD	**MSE**	**MAPE**	**MPE**
					277067	148301326485	0.0793	0.0138

Table 3-8 Moving Average Method (MA=3) for Export Data

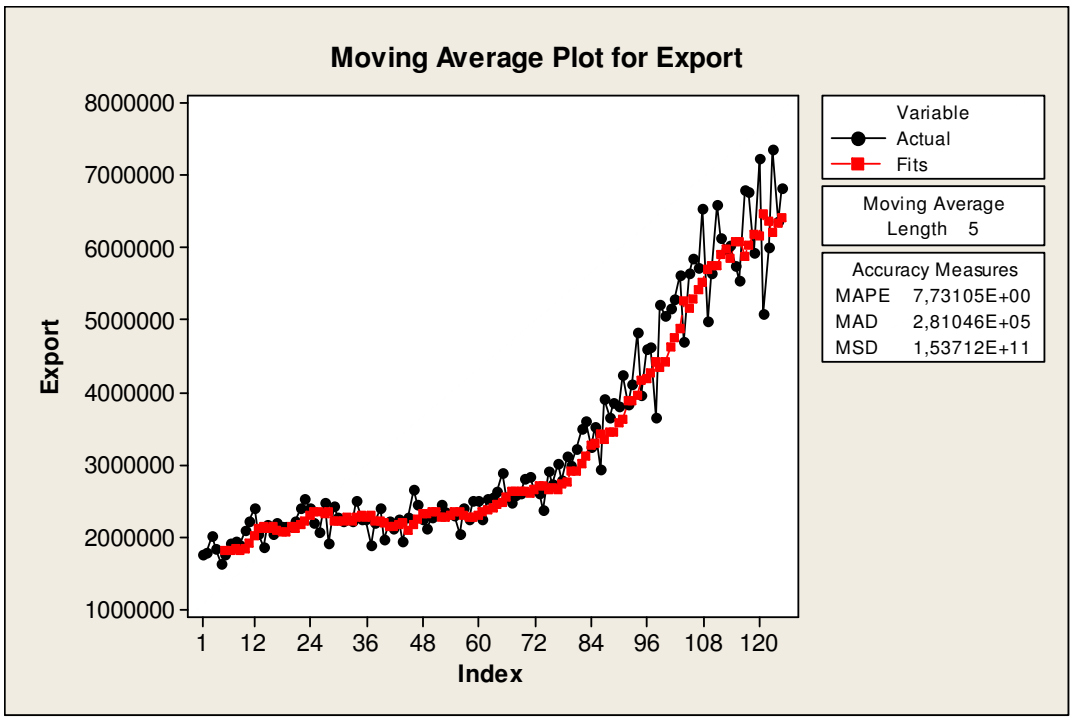

Figure 3-10 Moving Average Method (MA=5) for Export Data

Date	t	Y_t	$\hat{Y}_t$	e_t	$\lvert e_t \rvert$	e_t^2	$\lvert e_t \rvert / Y_t$	e_t / Y_t
1996-01	1	1752439						
1996-02	2	1779857						
1996-03	3	2009117						
1996-04	4	1827514						
1996-05	5	1623452						
1996-06	6	1746574	1798476	-51901	51901	2693743447	0.0297	-0.0297
…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…
2005-11	119	5942403	6188263	-245860	245860	60447191919	0.0414	-0.0414
2005-12	120	7245937	6169037	1076901	1076901	1159714922957	0.1486	0.1486
2006-01	121	5097404	6465531	-1368127	1368127	1871771419723	0.2684	-0.2684
2006-02	122	6012433	6374438	-362005	362005	131047912236	0.0602	-0.0602
2006-03	123	7380055	6214071	1165984	1165984	1359517650064	0.1580	0.1580
2006-04	124	6373763	6335646	38117	38117	1452895489	0.0060	0.0060
2006-05	125	6837874	6421919	415956	415956	173019136376	0.0608	0.0608
			TOTALS		33725529	18445380845281	9.2773	3.0143
					MAD	**MSE**	**MAPE**	**MPE**
					281046	153711507044	0.0773	0.0251

Table 3-9 Moving Average Method (MA=5) for Export Data

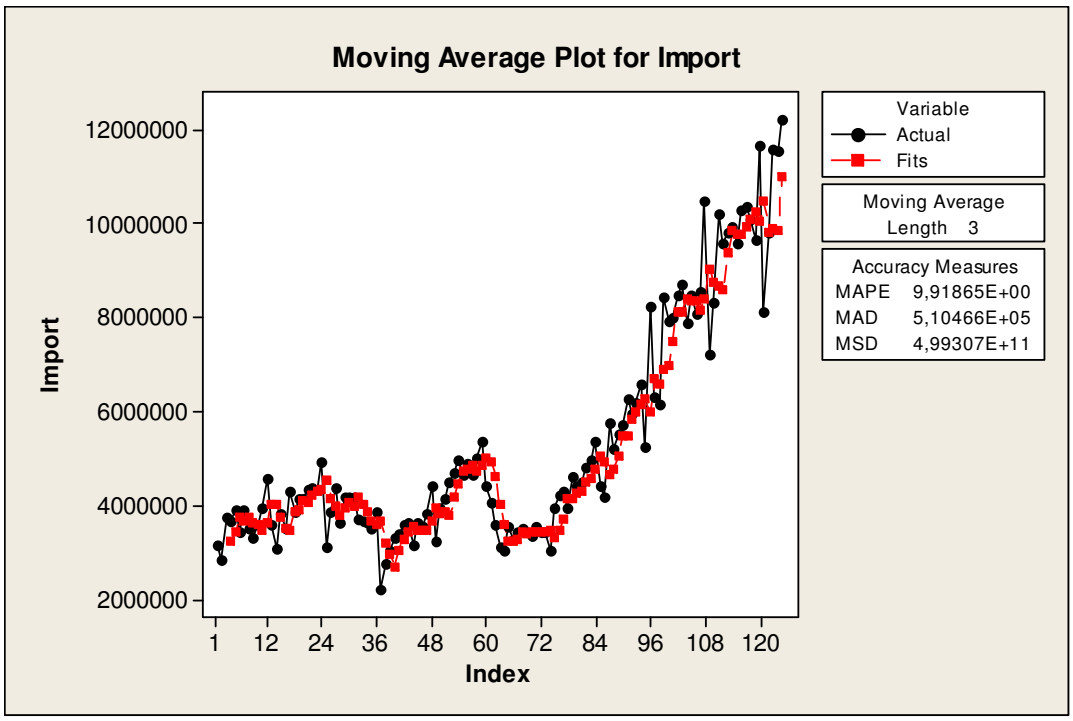

Figure 3-11 Moving Average Method (MA=3) for Import Data

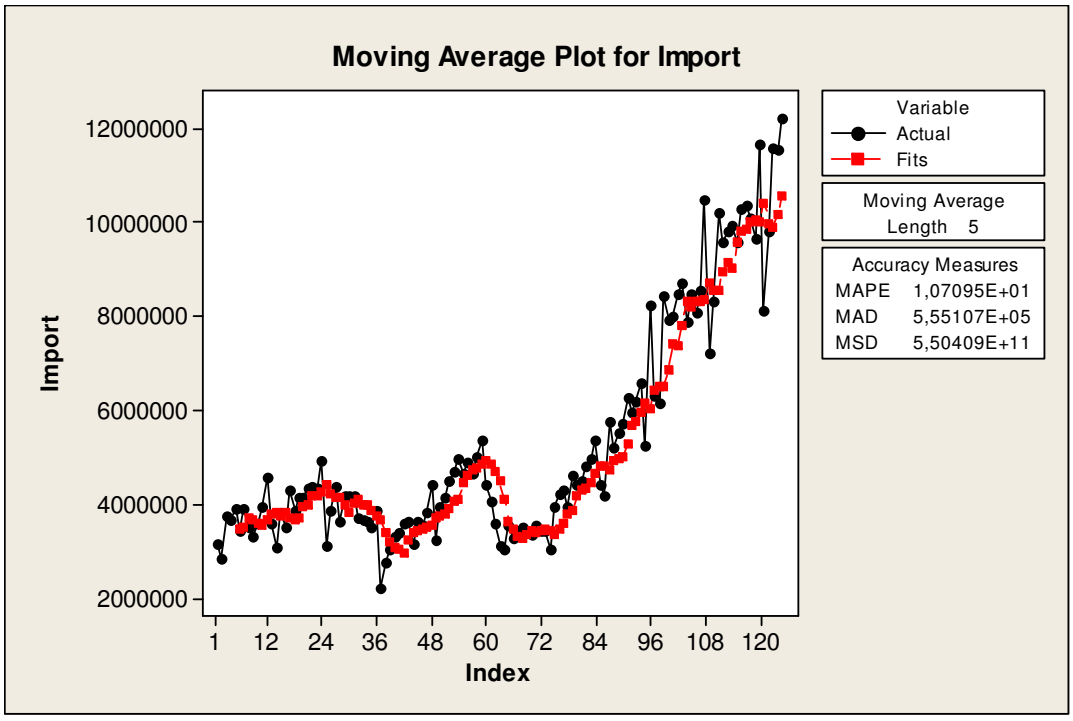

Figure 3-12 Moving Average Method (MA=5) for Import Data

3.4.2.3 Double Moving Averages

If the data being analyzed have a linear or quadratic trend, then both the simple and weighted moving averages may be inappropriate. Specifically, if a trend present in the data, simple moving averages will lag behind the actual data. In order to correct bias, a double moving average should be computed[55].

This method does what the name implies: One set of moving averages is computed, and a second set is then computed as a moving average of the first set.

Equations 3.15 through 3.18 summarize double moving average construction. First, Equation 3.15 is used to compute the moving average of order *k*.

$$M_t = \hat{Y}_{t+1} = \frac{Y_t + Y_{t-1} + Y_{t-2} + ... + Y_{t-k+1}}{k}$$

Then Equation 3.15 is used to compute the second moving average.

$$M_t' = \frac{M_t + M_{t-1} + M_{t-2} + ... + M_{t-k+1}}{k} \qquad (3.15)$$

Equation 3.16 is used to develop a forecast by adding the difference between the single and second moving averages to the single moving average.

$$a_t = M_t + (M_t - M_t') = 2M_t - M_t' \qquad (3.16)$$

Equation 3.17 is an additional adjustment factor, which is similar to a slope measure that can change over the series.

$$b_t = \frac{2}{k-1}(M_t - M_t') \qquad (3.17)$$

Finally, Equation 3.18 is used to make the forecast *p* periods into the future[56].

$$\hat{Y}_{t+p} = a_t + b_t p \qquad (3.18)$$

[55] Dale G. Bails, Larry C. Peppers, **Business Fluctuations: Forecasting Techniques and Applications**, USA: Prentice-Hall Inc., 1982, p. 338.
[56] Hanke and Wichern, p. 110-112.

where k = number of periods in the moving average and p = number of periods ahead to be forecast

	t	Y_t	M_t	M'_t	Value of a	Value of b	Forecast $a+bp$ (p=1)
1996-01	1	1752439					
1996-02	2	1779857					
1996-03	3	2009117	1847138				
1996-04	4	1827514	1872162				
1996-05	5	1623452	1820028	1846443	1793613	-26415	
1996-06	6	1746574	1732513	1808234	1656792	-75721	1767198
1996-07	7	1914651	1761559	1771367	1751751	-9808	1581071
…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…
2005-11	119	5942403	6509617	6310974	6708259	198643	7000474
2005-12	120	7245937	6653506	6514298	6792714	139208	6906902
2006-01	121	5097404	6095248	6419457	5771039	-324209	6931922
2006-02	122	6012433	6118591	6289115	5948068	-170524	5446830
2006-03	123	7380055	6163297	6125712	6200882	37585	5777544
2006-04	124	6373763	6588750	6290213	6887288	298537	6238467
2006-05	125	6837874	6863897	6538648	7189146	325249	7185825

Date	t	Y_t	$\hat{Y}_t$	e_t	$\lvert e_t \rvert$	e_t^2	$\lvert e_t \rvert / Y_t$	e_t / Y_t
1996-01	1	1752439						
1996-02	2	1779857						
1996-03	3	2009117						
1996-04	4	1827514						
1996-05	5	1623452						
1996-06	6	1746574	1767198	-20623	20623	425314903	0.0118	-0.0118
1996-07	7	1914651	1581071	333580	333580	111275377705	0.1742	0.1742
…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…
2005-12	120	7245937	6906902	339035	339035	114944942256	0.0468	0.0468
2006-01	121	5097404	6931922	-1834518	1834518	3365457892839	0.3599	-0.3599
2006-02	122	6012433	5446830	565603	565603	319906459244	0.0941	0.0941
2006-03	123	7380055	5777544	1602511	1602511	2568041306766	0.2171	0.2171
2006-04	124	6373763	6238467	135296	135296	18305037922	0.0212	0.0212
2006-05	125	6837874	7185825	-347951	347951	121069751256	0.0509	-0.0509
			TOTALS		40059274	26500344880239	11.8793	-0.5251
					MAD	**MSE**	**MAPE**	**MPE**
					333827	220836207335	0.0990	-0.0044

Table 3-10 Double Moving Averages Method for Export Data

	t	Y_t	M_t	M'_t	Value of a	Value of b	Forecast $a+bp$ (p=1)
1996-01	1	3154532					
1996-02	2	2860523					
1996-03	3	3742740	3252598				
1996-04	4	3663636	3422300				
1996-05	5	3899734	3768704	3481200	4056207	287503	
1996-06	6	3421921	3661764	3617589	3705939	44175	4343710
1996-07	7	3913323	3744993	3725153	3764832	19839	3750114
…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…
2005-11	119	9673050	10042914	10121206	9964621	-78293	10555130
2005-12	120	11682390	10481730	10255756	10707705	225974	9886328
2006-01	121	8139565	9831668	10118771	9544565	-287103	10933679
2006-02	122	9796674	9872876	10062092	9683661	-189215	9257463
2006-03	123	11583232	9839824	9848123	9831524	-8299	9494446
2006-04	124	11562738	10980881	10231194	11730569	749688	9823225
2006-05	125	12205551	11783841	10868182	12699499	915659	12480257

Date	t	Y_t	$\hat{Y}_t$	e_t	$\lvert e_t \rvert$	e_t^2	$\lvert e_t \rvert / Y_t$	e_t / Y_t
1996-01	1	3154532						
1996-02	2	2860523						
1996-03	3	3742740						
1996-04	4	3663636						
1996-05	5	3899734						
1996-06	6	3421921	4343710	-921789	921789	849694571526	0.2694	-0.2694
1996-07	7	3913323	3750114	163210	163210	26637478784	0.0417	0.0417
…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…
2005-12	120	11682390	9886328	1796062	1796062	3225837746751	0.1537	0.1537
2006-01	121	8139565	10933679	-2794115	2794115	7807076852442	0.3433	-0.3433
2006-02	122	9796674	9257463	539212	539212	290749097331	0.0550	0.0550
2006-03	123	11583232	9494446	2088786	2088786	4363027083765	0.1803	0.1803
2006-04	124	11562738	9823225	1739513	1739513	3025905830483	0.1504	0.1504
2006-05	125	12205551	12480257	-274705	274705	75463057033	0.0225	-0.0225
			TOTALS		70874784	82885033397310	13.8704	-1.0688
					MAD	**MSE**	**MAPE**	**MPE**
					590623	690708611644	0.1156	-0.0089

Table 3-11 Double Moving Averages Method for Import Data

3.4.3 Exponential Smoothing Methods

Since the development of exponential smoothing methods by Holt, Winters and Brown in 1960s, exponential smoothing forecast procedures have gained widespread popularity among business forecasters and have become a standard against which the performance of other, usually more sophisticated, quantitative forecasting methods is measured[57].

Whereas the method of moving averages only takes into account the most recent observations, simple exponential smoothing provides an exponentially weighted moving average of all previously observed values [58]. An exponentially weighted moving average is a means of smoothing random fluctuations that has the following desirable properties: (1) declining weight is put on older data, (2) it is extremely easy to compute, and (3) minimum data is reqired. A new value of the average is obtained merely by computing a weighted average of two variables, the value of the average from the last period and the current value of the variable[59]. The model is often appropriate for data with no predictable upward or downward trend. The aim is to estimate the current level. This level estimate is then used as the forecast of future values.

Exponential smoothing continually revises an estimate in the light of more recent experiences. This method is based on averaging (smoothing) past values of a series in an exponentially decreasing manner. The most recent observation receives the largest weight α (where $0 < \alpha < 1$), the next most recent observation receives less weight, $\alpha(1-\alpha)$, the observation two time periods in the past even less weight, $\alpha(1-\alpha)^2$, and so forth.

In one representation of exponentially smoothing, the new forecast (for time $t+1$) may be thought of as a weighted sum of the new observation (at time t) and the

---

[57] Johannes Ledolter and Bovas Abraham, "Some Comments on the Initialization of Exponential Smoothing", **Journal of Forecasting**, Vol. 3, 1, Jan-Mar 1984, p.79.
[58] Hanke and Wichern, p.114.
[59] Charles C. Holt, "Forecasting seasonals and trends by exponentially weighted moving averages", **International Journal of Forecasting,** 20 (2004) p. 5– 10.

old forecast (for time t). The weight α (where $0 < \alpha < 1$) is given to the old forecast. Thus,

New forecast = $[\alpha \times (\text{new observation})] + [(1-\alpha) \times (\text{old forecast})]$

More formally, the exponential smoothing equation is

$$\hat{Y}_{t+1} = \alpha Y_t + (1-\alpha)\hat{Y}_t \qquad (3.19)$$

where

$\hat{Y}_{t+1}$ = new smoothed value or the forecast value for the next period

α = smoothing constant ($0 < \alpha < 1$)

Y_t = new observation or actual value of series in period *t*

$\hat{Y}_t$ = old smoothed value or forecast for period *t*

Equation 3.19 can be written as

$$\hat{Y}_{t+1} = \alpha Y_t + (1-\alpha)\hat{Y}_t = \alpha Y_t + \hat{Y}_t - \alpha \hat{Y}_t$$

$$\hat{Y}_{t+1} = \hat{Y}_t + \alpha(Y_t - \hat{Y}_t)$$

In this form, the new forecast ($\hat{Y}_{t+1}$) is the old forecast ($\hat{Y}$) adjusted by α times the error $(Y_t - \hat{Y}_t)$ in the old forecast.

In Equation 3.19, the smoothing constant α serves as the weighted factor. The value of α determines the extent to which the current observation influences the forecast of the next observation. When α is closed to one, the new forecast will be essentially the current observation. (Equivalently, the new forecast will be the old forecast plus a substantial adjustment for any error that occurred in the preceding forecast.) Conversely, when α is close to zero, the new forecast will be very similar to the old forecast and the current observation will have very little impact.

Finally, Equation 3.19 implies, for time t that $\hat{Y}_t = \alpha Y_{t-1} + (1-\alpha)\hat{Y}_{t-1}$ and substitution for $\hat{Y}_t$ in Equation 3.19 gives

$$\hat{Y}_{t+1} = \alpha Y_t + (1-\alpha)\hat{Y}_t = \alpha Y_t + (1-\alpha)[\alpha Y_{t-1} + (1-\alpha)\hat{Y}_{t-1}]$$

$$\hat{Y}_{t+1} = \alpha Y_t + \alpha(1-\alpha)Y_{t-1} + (1-\alpha)^2 \hat{Y}_{t-1}$$

Continued substitution (next, substitute for $\hat{Y}_{t-1}$ and so forth) shows $\hat{Y}_{t+1}$ can be written as a sum of current and previous Y's with exponentially declining weights, or

$$\hat{Y}_{t+1} = \alpha Y_t + \alpha(1-\alpha)Y_{t-1} + \alpha(1-\alpha)^2 Y_{t-2} + \alpha(1-\alpha)^3 Y_{t-3} + \ldots \qquad (3.20)$$

That is, $\hat{Y}_{t+1}$ is an exponentially smoothed value. The speed at which past observations lose their impact depends on the value of α as demonstrated in Table 3-12.

Comparison of Smoothing Constants

	α=.1		**α=.6**	
Period	***Calculations***	***weight***	***Calculations***	***weight***
t		.100		.600
t-1	.9×.1	.090	.4 ×.6	.240
t-2	.9×.9×.1	.081	.4×.4×.6	.096
t-3	.9×.9×.9×.1	.073	.4×.4×.4×.6	.038
t-4	.9×.9×.9×.9×.1	.066	.4×.4×.4×.4×.6	.015
All others		.590		.011
	Totals	1.000		1.000

Table 3-12 Comparison of Smoothing Constants

Source: Hanke and Wichern, p. 115

Equations 3.19 and 3.20 are equivalent; Equation 3.19 is typically used to calculate the forecast $\hat{Y}_{t+1}$ because it requires less data storage and is easily implemented.

The value assigned to α is the key to the analysis. If it is desired that predictions be stable and random variations smoothed, a small value of α is required. If

a rapid response to a real change in the pattern of the observations is desired, a larger value of α is appropriate. One method of estimating α is an iterative procedure that minimizes the mean squared error (*MSE*) given by Equation 3.8. Forecasts are computed for, say, α equal to .1,.2,…,.9, and the sum of the squared forecast errors is computed for each. The value of α producing the smallest error is chosen for use in generating future forecasts[60].

To start to algorithm for Equation 3.19, an initial value for the old smoothed series must be set. One approach is to set the first smoothed value equal to the first observation. Another method is to use the average of the first five or six observations for the initial smoothed value.

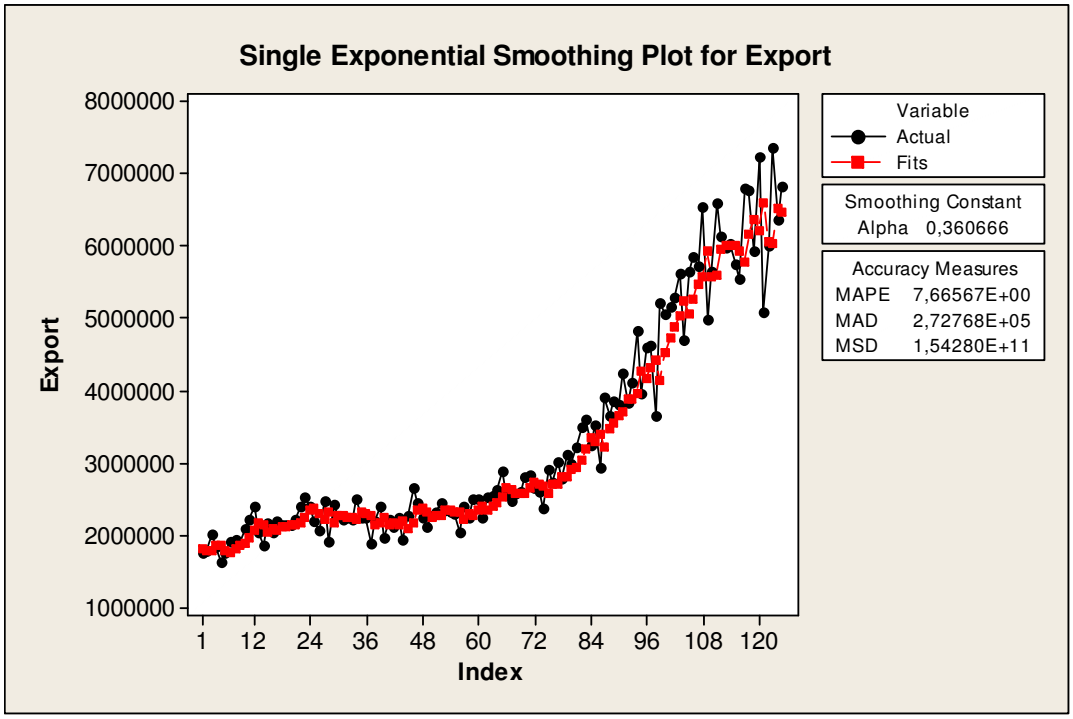

Figure 3-13 Single Exponential Smoothing Method for Export Data

[60] Hanke and Wichern, p.114-115.

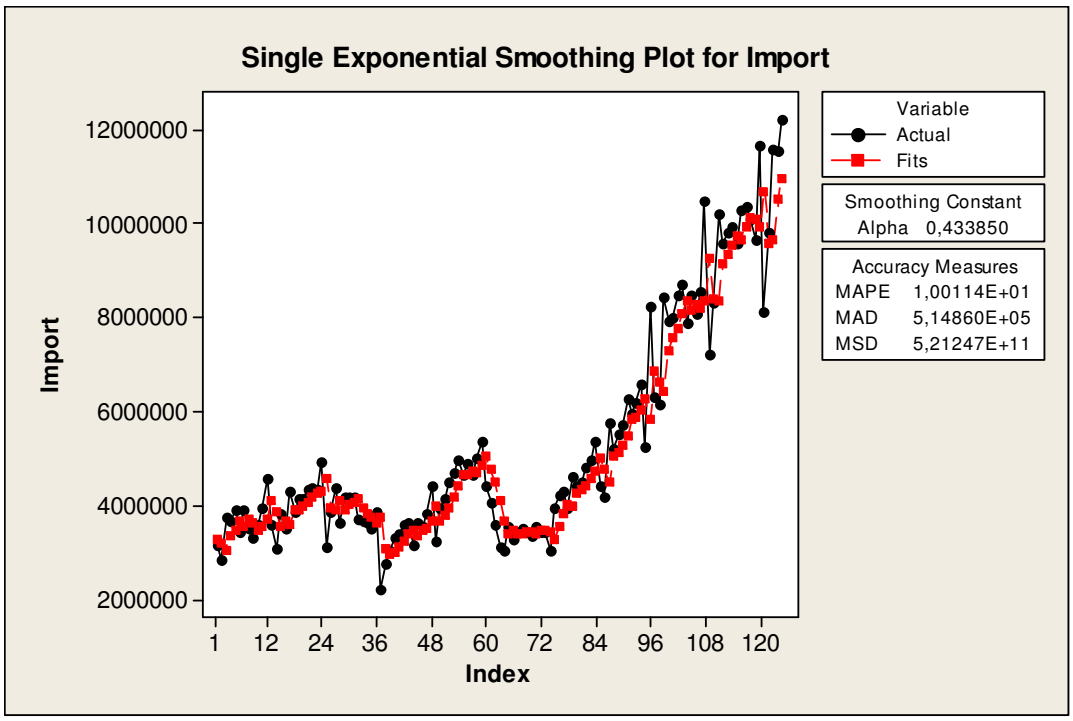

Figure 3-14 Single Exponential Smoothing Method for Import Data

Minitab uses the average of the first six observations for the initial smoothed value, and the smoothing constants of α=0.360666 for the export data and α=0.433850 for the import data were automatically selected by minimizing MSD.

Exponential smoothing is often a good forecasting procedure when a nonrandom time series exhibits trending behavior. It is useful to develop a measure that can be used to determine when the basic pattern of a time series has changed. A *tracking signal* is one way to monitor change. A tracking signal involves computing a measure of forecast errors over time and setting limits so that, when the errors go outside those limits, the forecaster is alerted [61].

For example, a tracking signal might be used to determine when the size of the smoothing constant alpha (α) should be changed. Since a large number of items are usually being forecast, common practice is to continue with the same value of α for

[61] Hanke and Wichern, p.118.

many periods before attempting to determine if a revision is necessary. Unfortunately, the simplicity of using an established exponential smoothing model is a strong motivator for not making a change. But at some point it may be necessary to update α or abandon exponential smoothing altogether. When the model produces forecasts containing a great deal of error, a change is appropriate.

A tracking system is a method for monitoring the need for change. Such a system contains a range of permissible deviations of the forecast from actual values. So long as forecasts generated by exponential smoothing fall within this range, no change in α is necessary. However, if a forecast falls outside the range, the system signals a need to update α.

For instance, if things are going well, forecasting technique should over- and underestimate equally often. A tracking signal based on this rationale can be developed.

Let U equal the number of underestimates out of the last k forecasts. In other words, U is the number of errors out of the last k that are positive. If the process is in control, the expected value of U is $k/2$ but sampling variability is involved, so values close to $k/2$ would not be unusual. On the other hand, values that are not close to $k/2$ would indicate that the technique is producing biased forecasts.

Another way of tracking a forecasting technique is to determine a range that should contain the forecasting errors, which can be accomplished by using the *MSE* that was established when the optimally sized α was determined. If the exponential smoothing technique is reasonably accurate, the forecast error should be approximately normally distributed about a mean of zero. Under this condition, there is about a 95% chance that the actual observation will fall within approximately 2 standard deviations of the forecast. Using $\sqrt{MSE}$ as an estimate of the standard deviation of the forecast error, approximate 95% error limits can be determined. Forecast errors falling within these limits indicate no cause for alarm. Errors (particularly a sequence of errors) outside the limits suggest a change[62].

[62] Hanke and Wichern, p.120.

For Turkish export data, the optimal α was determined to be α=0.360666 with MSE=MSD=1.54280E+11. An estimate of the standard deviation of the forecast errors is $\sqrt{MSE} = \sqrt{1.5428 \times 10^{11}} = 392785$. If the forecast errors are approximately normally distributed about a mean of zero, there is about a 95% chance that the actual observation will fall within 2 standard deviations of the forecast or within

$$\pm 2\sqrt{MSE} = \pm 2\sqrt{1.5428 \times 10^{11}} = \pm 2(392785) = 785570$$

For Turkish export data, the permissible absolute error is 785570. If for any future forecast the magnitude of the error is greater than 785570, there is reason to believe that the optimal smoothing constant α should be updated or a different forecasting method considered.

Simple exponential smoothing works well when the data vary about a level that changes infrequently. Whenever a sustained trend exists, exponential smoothing will lag behind the actual values over time. Holt's linear exponential smoothing technique, which is designed to handle data with a well-defined trend, addresses this problem.

3.4.3.1 Exponential Smoothing Adjusted for Trend: Holt's Method

In simple exponential smoothing the level of the time series is assumed to be changing occasionally, and an estimate of the current level is required. In some situations, the observed data will be clearly trending and will contain information that allows the anticipation of future upward movements. When this is the case, a linear trend forecast function is needed. Because business and economic series rarely exhibit a fixed linear trend, we consider the possibility of modeling evolving local linear trends over time. Holt (1957) developed an exponential smoothing method, *Holt's linear exponential smoothing*, which is sometimes called *double exponential smoothing method*, that allows for evolving local linear trends in a time series and can be used to generate forecasts.

When a trend in the time series is anticipated, an estimate of the current slope as well as the current level is required. Holt's technique smoothes the level and slope directly by using different smoothing constants for each. These smoothing constants provide estimates of level and slope that adopt over time as new observations become available. One of the advantages of Holt's technique is that it provides a great deal of flexibility in selecting the rates at which the level and trend are tracked.

The three equations used in Holt's method are:

1. The exponentially smoothed series, or current level estimate:

$$L_t = \alpha Y_t + (1-\alpha)(L_{t-1} + T_{t-1}) \qquad (3.21)$$

2. The trend estimate:

$$T_t = \beta(L_t - L_{t-1}) + (1-\beta)T_{t-1} \qquad (3.22)$$

3. Forecast p periods into the future:

$$\hat{Y}_{t+p} = L_t + pT_t \qquad (3.23)$$

where

L_t = new smoothed value (estimate of current level)

α = smoothing constant for the level ($0 < \alpha < 1$)

Y_t = new observation or actual value of series in period t

β = smoothing constant for trend estimate ($0 < \beta < 1$)

T_t = trend estimate

p = periods to be forecast into the future

$\hat{Y}_{t+p}$ = forecast for p periods into the future

Equation 3.21 is very similar to the equation for simple exponential smoothing Equation 3.19, except that a term (T_{t-1}) has been incorporated to properly update the

level when a trend exists. That is, the current level (L_t) is calculated by taking a weighted average of two estimates of level—one estimate is given by the current observation (Y_t), and the other estimate is given by adding the previous trend (T_{t-1}) to the previously smoothed level (L_{t-1}). If there is no trend in the data, there is no need for the term T_{t-1} in Equation 3.21, effectively reducing it to Equation 3.19. There is also no need for Equation 3.22.

A second smoothing constant, β, is used to create the trend estimate. Equation 3.22 shows that the current trend (T_t) is a weighted average (with weights β and $1-\beta$) of two trend estimates- one estimate is given by the change in the level from time $t-1$ to t $(L_t - L_{t-1})$, and the other estimate is the previously smoothed trend (T_{t-1}). Equation 3.22 is similar to the Equation 3.21, except that the smoothing is done for the trend rather than the actual data.

Equation 3.23 shows the forecast for *p* periods into the future. For a forecast made at time *t*, the current trend estimate (T_t) is multiplied by the number of periods to be forecast (p), and the product is then added to the current level (L_t). Note that the forecasts for future periods lie along a straight line with slope T_t and intercept L_t.

As with simple exponential smoothing, the smoothing constants α and β can be selected subjectively or by minimizing a measure of forecast error such as the *MSE*. Large weights result in more rapid changes in the component; small weights result in less rapid changes. Therefore, the larger the weights, the more the smoothed values follow the data; the smaller the weights, the smoother the pattern in the smoothed values.

We could develop a grid of values of α and β (e.g. each combination of $\alpha = 0.1, 0.2, ..., 0.9$ and $\beta = 0.1, 0.2, ..., 0.9$) and then select the combination that provides the lowest *MSE*. Most forecasting software packages use an optimization algorithm to minimize *MSE*. We might insist that $\alpha = \beta$, thus providing equal amounts of smoothing

for the level and the trend. In the special case where $\alpha = \beta$, Holt's approach is the same as Brown's double exponential smoothing[63].

To get started, initial values for L and T in Equation 3.21 and 3.22 must be determined. One approach is to set the first estimate of the smoothed level equal to the first observation. The trend is then estimated to be zero. A second approach is to use the average of the first five or six observations as the initial smoothed value L. The trend is then estimated using the slope of a line that is fit to these five or six observations. Minitab develops a regression equation using the variable of interest as Y and time as the independent variable X. The constant from this equation is the initial estimate of the level component, and the slope or regression coefficient is the initial estimate of the trend component.

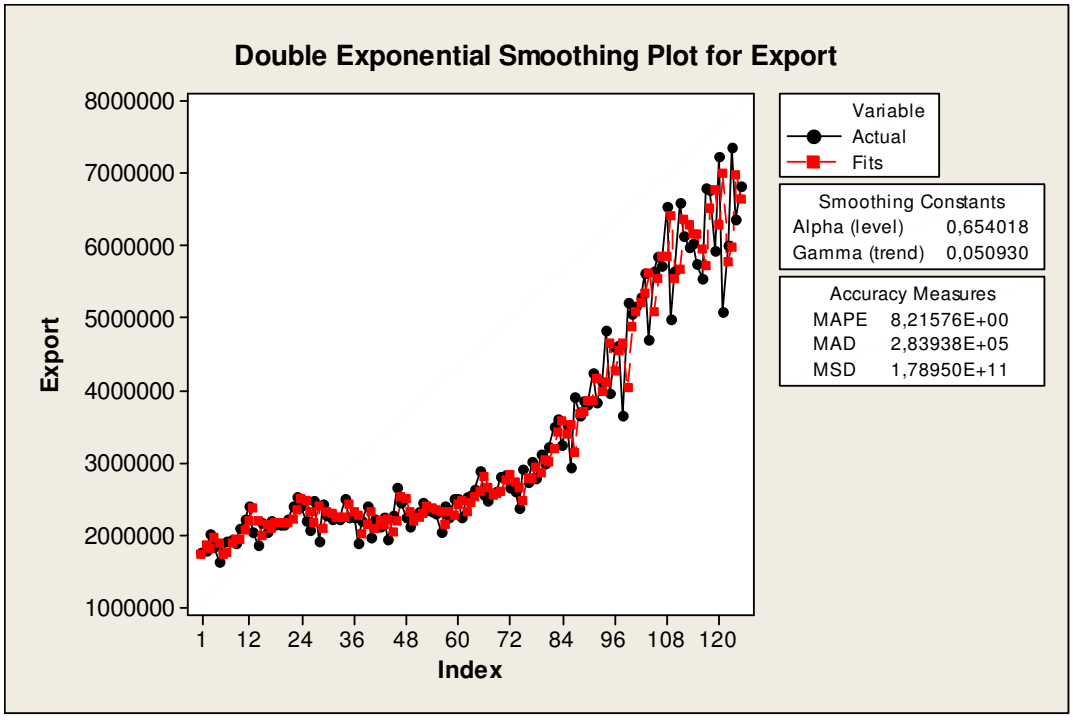

Figure 3-15 Double Exponential Smoothing Method for Export Data

[63] Hanke and Wichern, p.121-122.

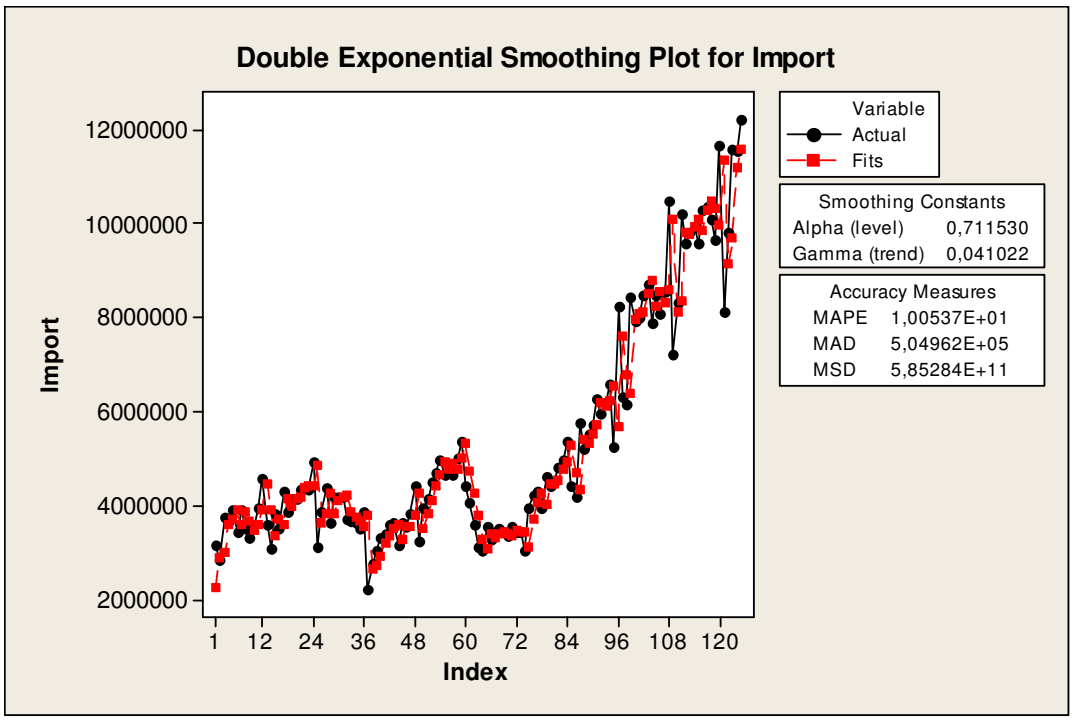

Figure 3-16 Double Exponential Smoothing Method for Import Data

In the Minitab program the trend parameter gamma is identical to beta used in equation 3.22. On the basis of minimizing the MSE, for the export and import data over the period from 1996 to 2006, Holt's linear smoothing does not reproduce the data any better than simple exponential smoothing.

3.4.3.2 Holt-Winter's Trend and Seasonality Method

Among the most widely known and used forecasting techniques for seasonal time series are the methods proposed by Winters (1960), one for additive seasonality (additive Holt– Winters method) and one for multiplicative seasonality (multiplicative Holt–Winters method). Of these two methods, the one for multiplicative seasonality has been implemented more often in computer forecasting software[64].

[64] Anne B. Koehler , Ralph D. Snyder and J. Keith Ord, "Forecasting models and prediction intervals for the multiplicative Holt–Winters method", **International Journal of Forecasting**, 17 (2001) p. 269–286.

If the data have no trend or seasonal patterns, then moving averages or single exponential smoothing methods are appropriate. If the data exhibit a linear trend, Holt's linear method is appropriate. But if the data are seasonal, these methods, on their own, cannot handle the problem well.

Holt's method was extended by Winters to capture seasonality directly. The Holt- Winters' method is based on three smoothing equations– one for the level, one for trend, and one for seasonality. It is similar to Holt's method, with one additional equation to deal with seasonality. In fact there are two different Holt-Winters' methods, depending on whether seasonality is modeled in an additive or multiplicative way.

Multiplicative seasonality:

The basic equations for Holt-Winters' multiplicative methods are as follows:

Level: $L_t = \alpha \frac{Y_t}{S_{t-s}} + (1-\alpha)(L_{t-1} + b_{t-1})$

Trend: $b_t = \beta(L_t - L_{t-1}) + (1-\beta)b_{t-1}$

Seasonal: $S_t = \gamma \frac{Y_t}{L_t} + (1-\gamma)S_{t-s}$

Forecast: $F_{t+m} = (L_t + b_t m)S_{t-s+m}$

where s is the length of seasonality (e.g., number of months or quarters in a year), L_t represents the level of series, b_t denotes the trend, S_t is the seasonal component, and F_{t+m} is the forecast for m periods ahead.

Additive Seasonality:

The seasonal component in Holt-Winters' method may also be treated additively, although this is less common. The basic equations for Holt-Winters' additive methods are as follows[65]:

Level: $L_t = \alpha(Y_t - S_{t-s}) + (1-\alpha)(L_{t-1} + b_{t-1})$

Trend: $b_t = \beta(L_t - L_{t-1}) + (1-\beta)b_{t-1}$

Seasonal: $S_t = \gamma(Y_t - L_t) + (1-\gamma)S_{t-s}$

Forecast: $F_{t+m} = L_t + b_t m + S_{t-s+m}$

[65] Makridakis, et al., *Forecasting: Methods and Applications*, p. 164-169.

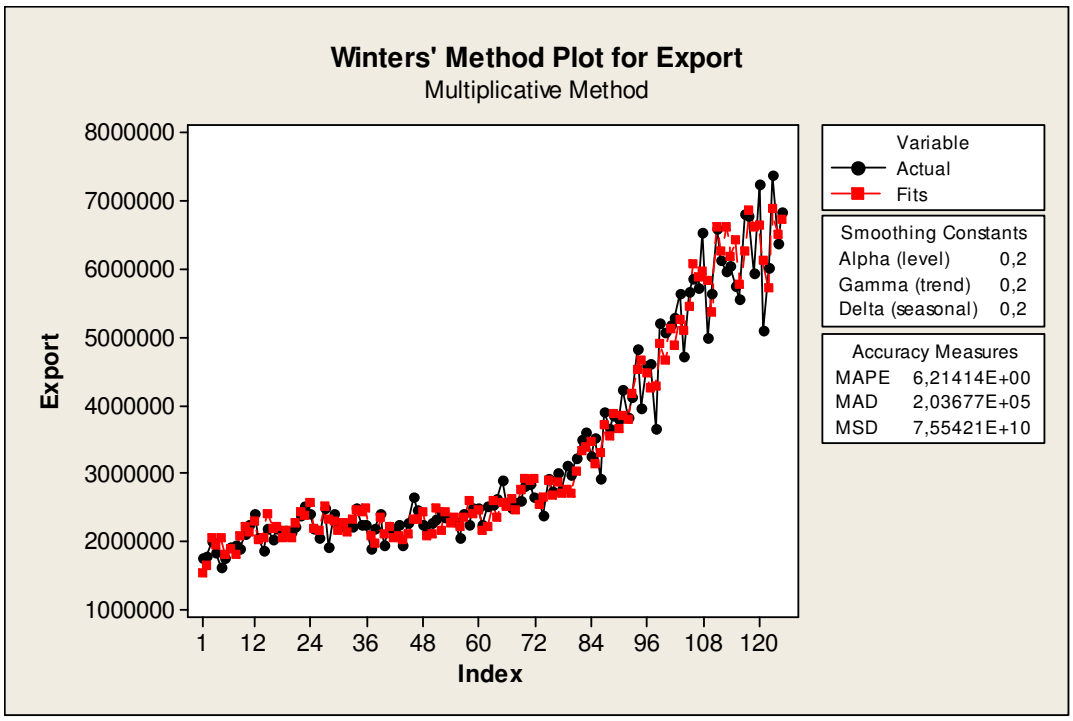

Figure 3-17 Winters' Method-Multiplicative- for Export Data

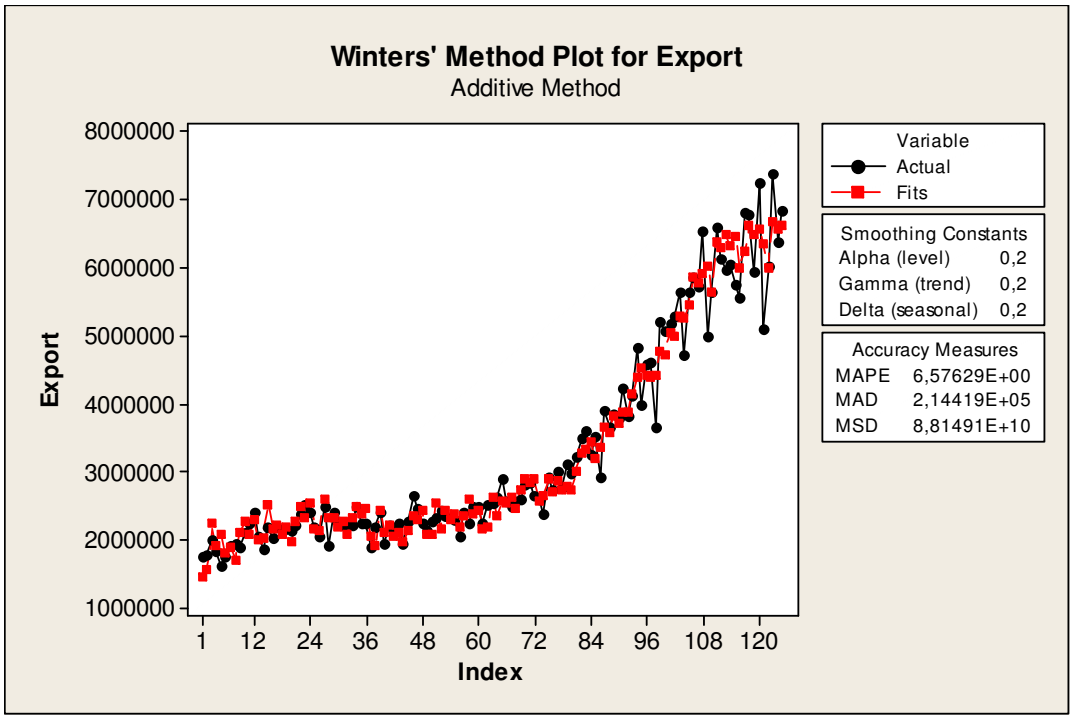

Figure 3-18 Winters' Method-Additive- for Export Data

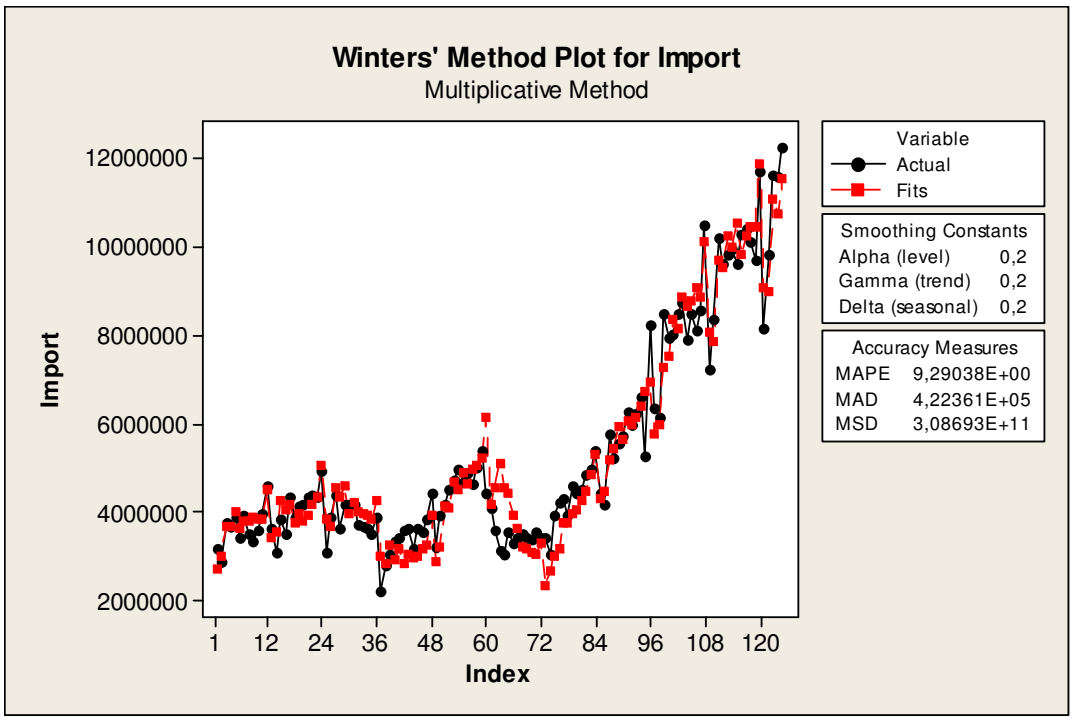

Figure 3-19 Winters' Method-Multiplicative- for Import Data

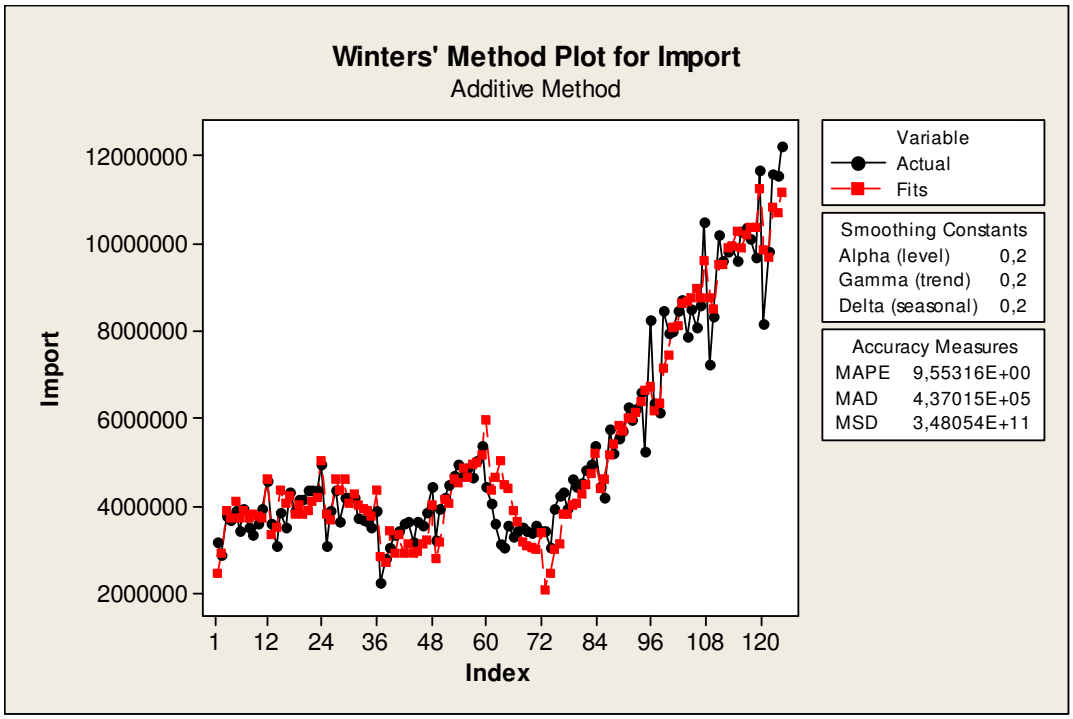

Figure 3-20 Winters' Method-Additive- for Import Data

3.5 Time Series and Their Components

In general, time series do not behave like a random sample and require special methods for their analysis. Observations of a time series are typically related to one another (autocorrelated). This dependence produces patterns of variability that can be used to forecast future values and assist in the management of business operations.

3.5.1 Decomposition

One approach to the analysis of time series data involves an attempt to identify the component factors that influence each of the values in a series. This identification procedure is called *decomposition*. Each component is identified separately. Projections of each of the components can then be combined to procedure forecasts of future values of the time series. Decomposition methods are used for both short-run and long-run forecasting. They are also used to simply display the underlying growth or decline of a series, or to adjust the series by eliminating one or more of the components.

Analyzing a time series by decomposing it into its component parts has a long history[66]. Seasonal fluctuations account for a major part in the variation in the growth rates of most quarterly and monthly business and economic time series. In order to make inferences on the nature of the business cycles and long-run growth, the 'traditional' approach is to remove the seasonal component of a series through the use of deterministic dummies, seasonal differencing, or by the use seasonal adjustment methods[67]. Recently, however, decomposition methods of forecasting have lost some of their luster. Projecting the individual components into the future and recombining these projections to form a forecast of the underlying series often does not work very well in practice. The difficulty lies in getting accurate forecasts of the components. The development of more flexible, model-based forecasting procedures has made decomposition primarily a tool for understanding a time series rather than a forecasting method in its own right.

---

[66] Hanke and Wichern, p.157-158.
[67] Jan G. De Gooijer, Philip Hans Fransesb, "Forecasting and seasonality", **International Journal of Forecasting**, 13 (1997), p. 303-305.

To understand decomposition, we start with the four components of a time series. These are the trend component, the cyclical component, the seasonal component, and the irregular or random component.

1. *Trend*. The trend is the component that represents the underlying growth (or decline) in a time series. The trend may be produced, for example, by consistent population change, inflation, technological change, and productivity increases. The trend is denoted by *T*.

2. *Cyclical*. The cyclical component is a series of wavelike fluctuations or cycles of more than one year's duration. Changing economic conditions generally produce cycles. *C* denotes the cyclical component.

In practice, cycles are often difficult to identify and are frequently regarded as part of the trend. In this case, the underlying general growth (or decline) component is called the *trend-cycle* and denoted by *T*. we use the notation for the trend because the cyclical component often cannot be separated from the trend.

3. *Seasonal*. Seasonal fluctuations are typically found in quarterly, monthly, or weekly data. Seasonal variation refers to a more or less stable pattern of change that appears annually and repeats itself year after year. Seasonal patterns occur because of the influence of the weather, or because of calendar-related events such as school vacations and national holidays. *S* denotes the seasonal component.

4. *Irregular*. The irregular component consists of unpredictable or random fluctuations. These fluctuations are the result of a myriad of events that individually may not be particularly important but whose combined effect could be large. *I* denotes the irregular component.

To study the components of a time series, the analyst must consider how the components relate to the original series. This task is accomplished by specifying a *model* (mathematical relationship) that expresses the time-series variable *Y* in terms of the components *T*, *C*, *S*, and *I*. A model that treats the time-series values as a sum of the components is called an *additive components* model. A model that treats the time-series

values as the product of the components is called a *multiplicative components model*. Both models are sometimes referred to as *unobserved components models* because, in practice, although we observe the values of the time series, the values of the components are not observed. The approach to time-series analysis described in this section involves an attempt, given the observed series, to estimate the values of the components. These estimates can then be used for forecasting or to display the series unencumbered by seasonal fluctuations. The latter process is called *seasonal adjustment*.

It is difficult to deal with the cyclical component of a time series. To the extent that cycles can be determined from historical data, both their lengths (measured in years) and magnitudes (differences between highs and lows) are far from constant. This lack of a consistent wavelike pattern makes distinguishing cycles from smoothly evolving trends difficult. Consequently, to keep things relatively simple we will assume any cycle in the data is part of the trend. Initially, then, we only consider the three components, *T*, *S*, and *I*.

The two simplest models relating the observed value (Y_t) of a time series to the trend (T_t), seasonal (S_t), and irregular (I_t) components are the additive components model

$$Y_t = T_t + S_t + I_t \qquad \textbf{(3.24)}$$

and the multiplicative components model

$$Y_t = T_t \times S_t \times I_t \qquad \textbf{(3.25)}$$

It is possible to convert a multiplicative decomposition to an additive decomposition by working with the logarithms of the data. Using Equation 3.25 and the properties of logarithms we have $\log Y = \log(T \times S \times I) = \log T + \log S + \log I$.

The additive components model works best when the time series being analyzed has roughly the same variability throughout the length of the series. That is, all

the values of the series fall essentially within a band of constant width centered on the trend.

The multiplicative components model works best when the variability of the time series increases with the level. That is, the values of the series spread out as the trend increases, and the set of observations have the appearance of a megaphone, or funnel[68].

3.5.2 Trend

The first step in the analysis of non-stationary time-series data usually involves estimation and/or elimination of the trend component. In Kendal and Buckland trend is defined as 'a long-term movement in an ordered series, say a time series, which may be regarded, together with the oscillation and random component, as generating the observed values. An essential feature of the concept of trend is that it is smooth over periods that are long in relation to the unit of time for which the series is recorded'[69].

Trends are long-term movements in a time series that can sometimes be described by a straight line or a smooth curve. Examples of the basic forces producing or affected the trend of a series are population change, price change, technological change, productivity increases, and product life cycles.

For business and economic time series, it is best to view the trend (or trend-cycle) as smoothly changing over time. Rarely can we realistically assume that the trend can be represented by some simple function such as a straight line over the whole period for which the time series is observed. However, it is often convenient to fit a trend curve to a time series for two reasons (1) It provides some indication of the general direction

[68] Hanke and Wichern, p.158-159.
[69] MG Kendall and WR Buckland, **A Dictionary of Statistical Terms,** International Statistical Institute: Oliver Boyd, London, 1957. cited by G. Mosheiov and A. Raveh, "On Trend Estimation of Time-Series: A Simpler Linear Programming Approach", **The Journal of the Operational Research Society,** Vol. 48, No. 1. (Jan., 1997), p. 90-96.

of the observed series, and (2) it can be removed from the original series to get a clearer picture of the seasonality.

If the trend appears to be roughly linear, that is, if it increases or decreases like a straight line, then it is represented by the equation

$$\hat{T}_t = b_0 + b_1 t \qquad (3.26)$$

Here $\hat{T}_t$ is the predicted value for the trend at time t. The symbol t used for the independent variable represents time and ordinarily assumes integer values 1, 2, 3,... corresponding to consecutive time periods. The slope coefficient b_1 is the average increase or decrease in T for each one-period increase in time.

Time trend equations, including the straight-line trend, can be fit to the data using the *method of least squares*. This method selects the values of the coefficients in the trend equation (b_0 and b_1 in the straight-line case) so that the estimated trend values $\hat{T}_t$ are close to the actual values Y_t as measured by the sum of squared errors criterion[70]

$$SSE = \sum (Y_t - \hat{T}_t)^2 \qquad (3.27)$$

[70] Hanke and Wichern, p.160-161.

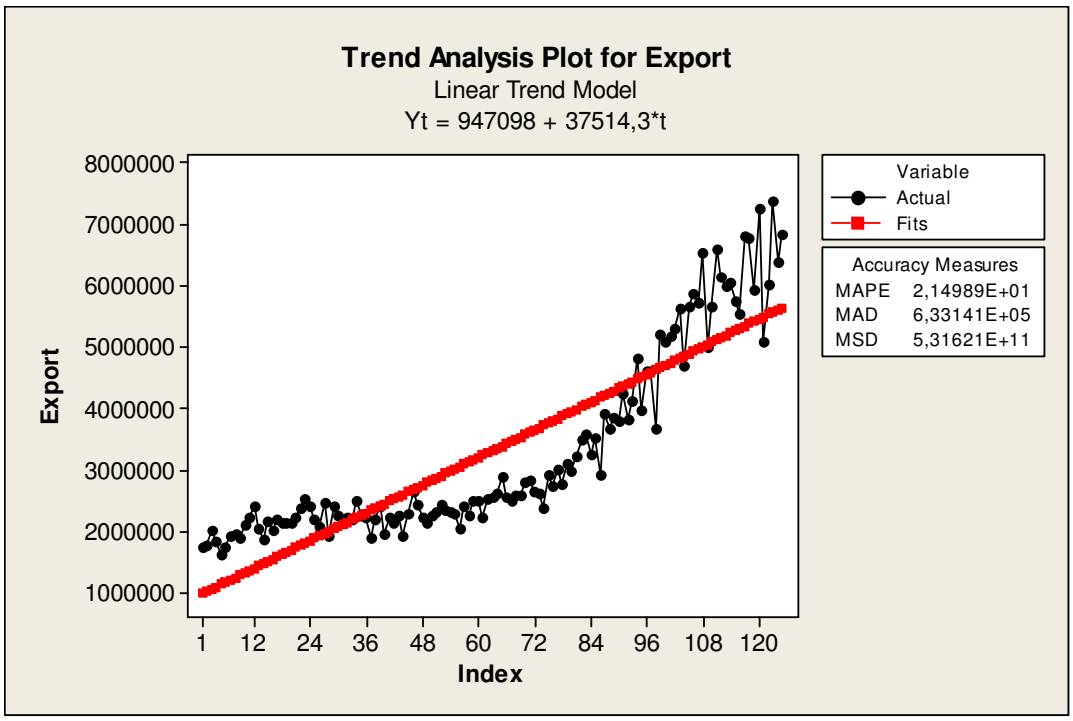

Figure 3-21 Linear Trend Model for Export Data

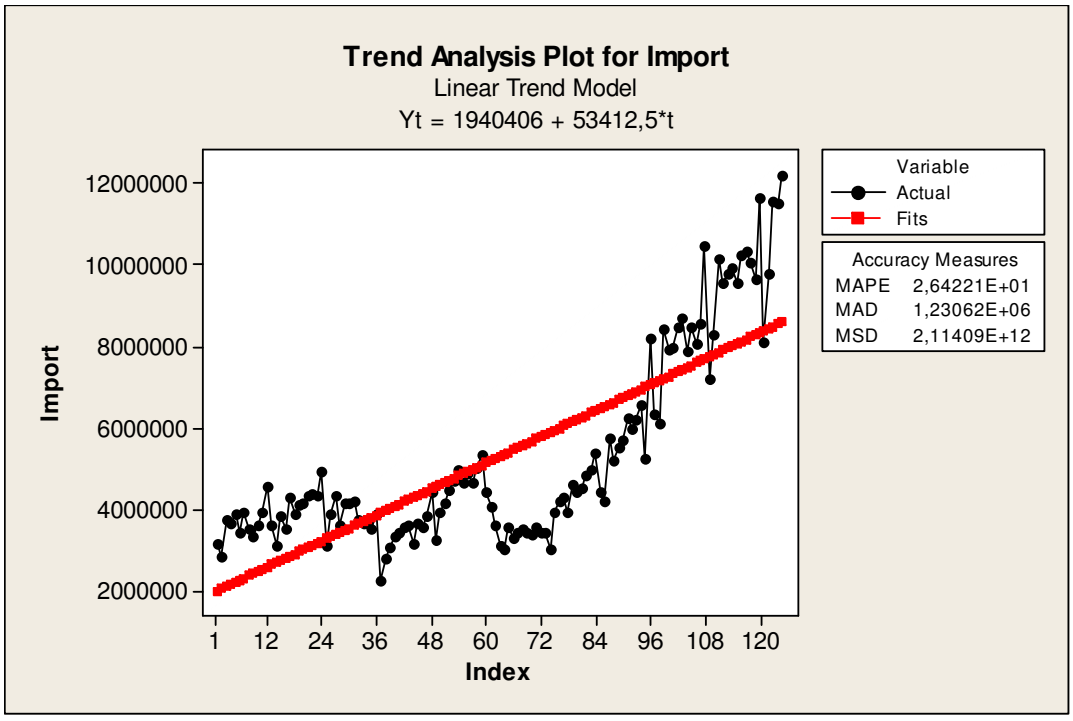

Figure 3-22 Linear Trend Model for Import Data

3.5.2.1 Additional Trend Curves

The life cycle of a new product has three stages: introduction, growth, and maturity and saturation. Time, shown on the horizontal axis, can vary from days to years depending on the nature of the market. A straight-line trend would not work for these data. Linear models assume that a variable is increasing (or decreasing) by a constant amount each time period. The increases per time period in the product life cycle curve are quite different depending on the stage of the cycle. A curve, other than a straight line, is needed to model the trend over a new-product life cycle.

A simple function that allows for curvature is the quadratic trend

$$\hat{T}_t = b_0 + b_1 t + b_2 t^2 \qquad (3.28)$$

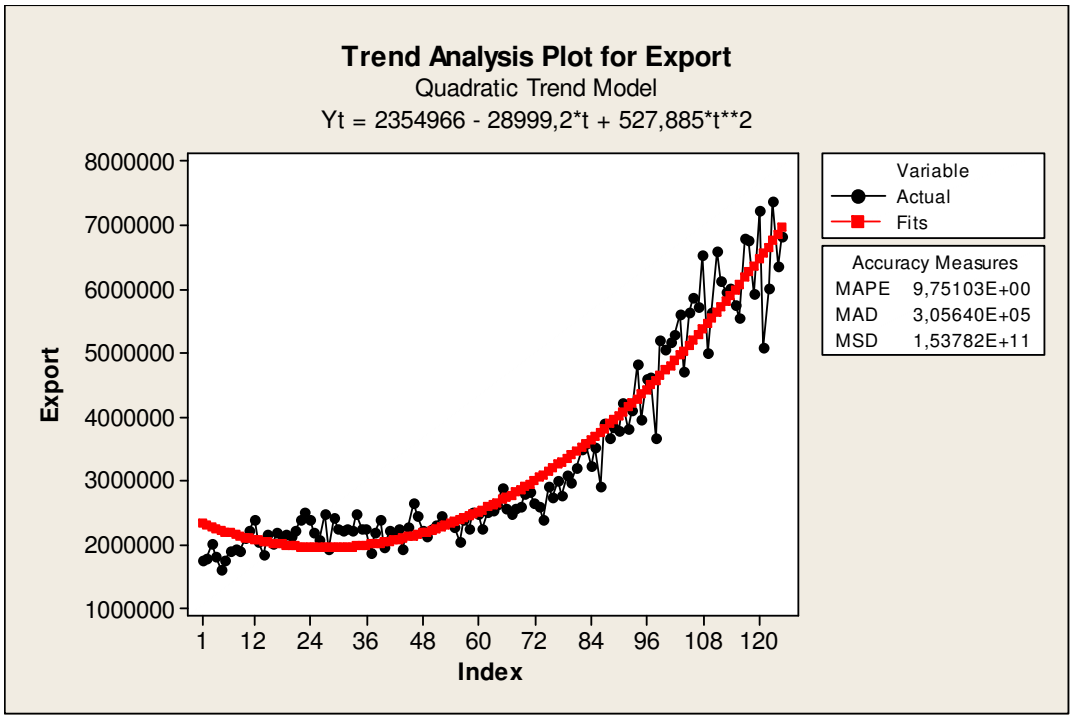

Figure 3-23 Quadratic Trend Model for Export Data

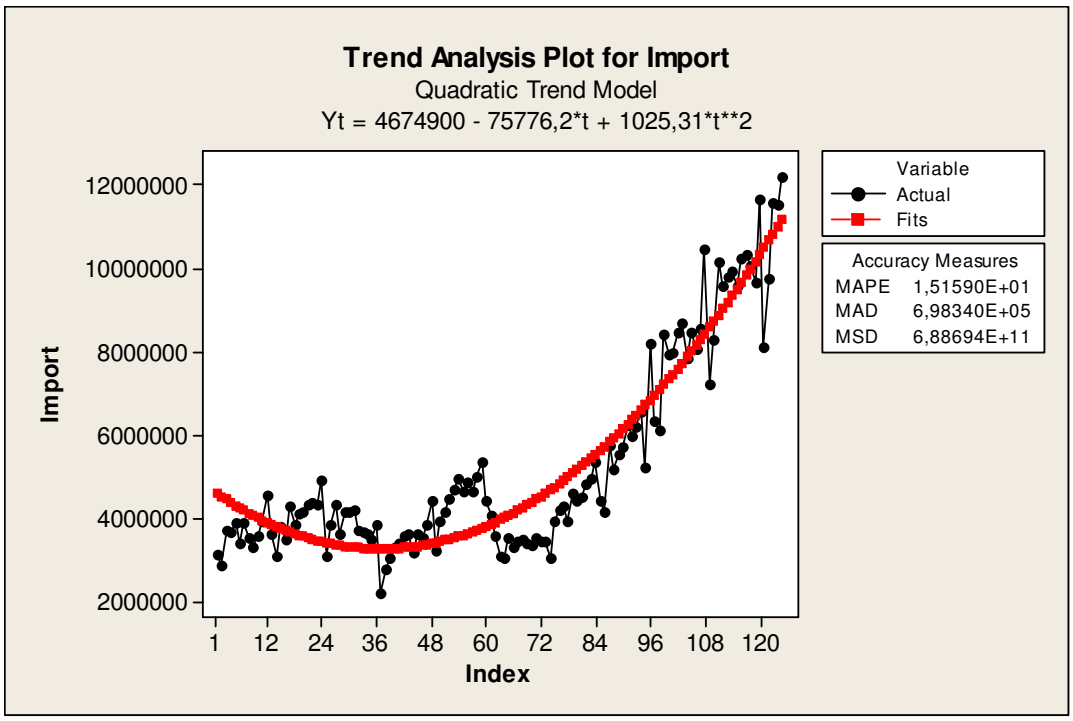

Figure 3-24 Quadratic Trend Model for Import Data

Based on the *MAPE*, *MAD*, and *MSD* accuracy measures, a quadratic trend appears to be a better representation of the general direction of Turkish exports. Which trend model is appropriate? Before considering this issue, we will introduce a few additional trend curves that have proved useful.

When a time series starts slowly and then appears to be increasing at an increasing rate such that the percentage difference from observation to observation is constant, an exponential trend can be fitted. The exponential trend is given by

$$\hat{T}_t = b_0 b_1^t \qquad (3.29)$$

The coefficient b_1 is related to the growth rate. If the exponential trend is fit to annual data, the annual growth rate is estimated to be $100(b_1 - 1)\%$ [71].

[71] Hanke and Wichern, p.164-165.

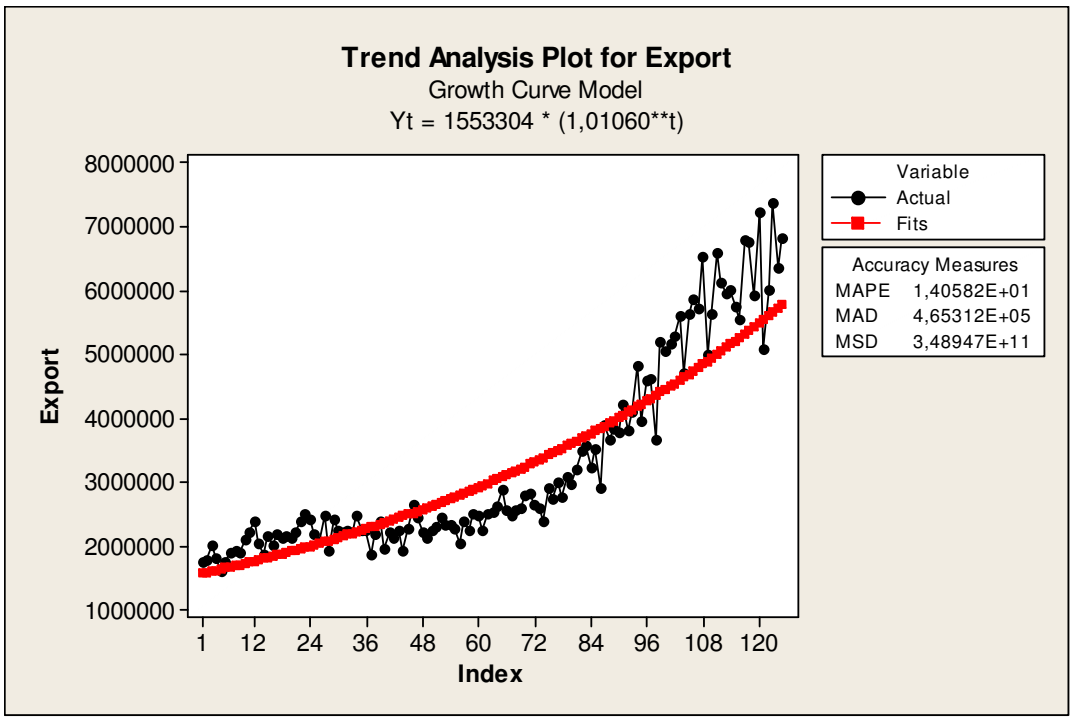

Figure 3-25 Growth Curve Model for Export Data

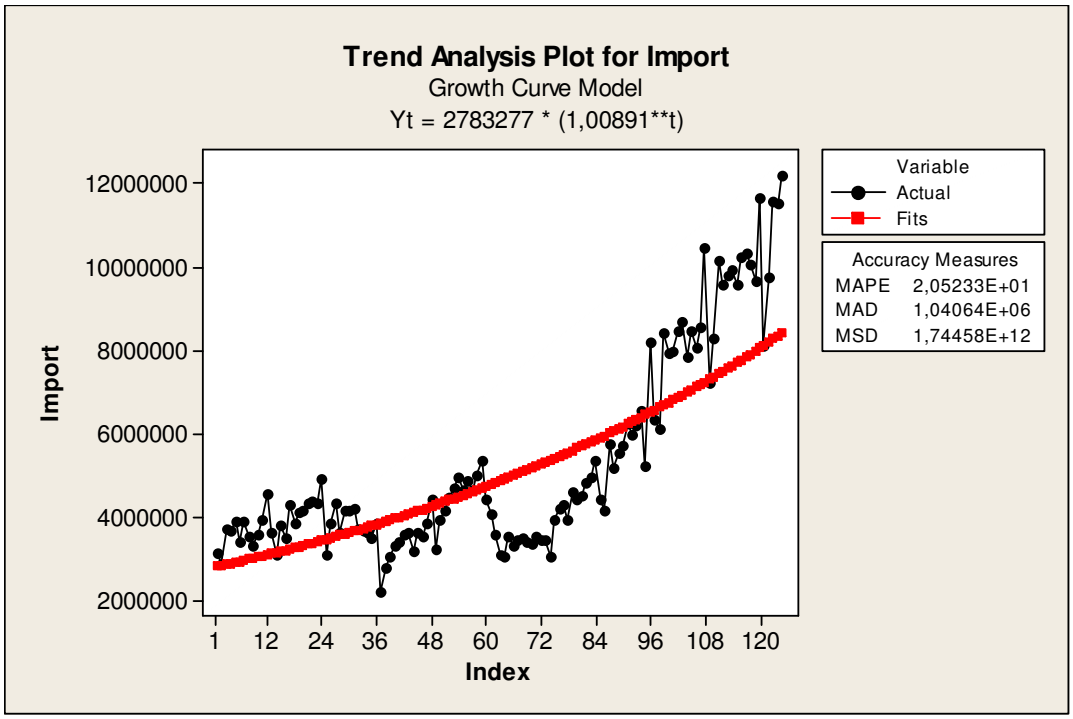

Figure 3-26 Growth Curve Model for Import Data

Exponential trend curves fit to Turkish export and import data have the equations

$$\hat{T}_t = 1553304(1.01060)^t \text{ and } \hat{T}_t = 2783277(1.00891)^t$$

respectively implying a monthly growth rate of about 1.06% for exports and 0.81% for imports.

3.5.2.2 Seasonality

A seasonal pattern is one that repeats itself year after year. For annual data, seasonality is not an issue because there is no chance to model a within-year pattern with data recorded once per year. However, time series consisting of weekly, monthly, or quarterly observations often exhibit seasonality.

Several methods for measuring seasonal variation have been developed. The basic idea in all of those methods is to first estimate and remove the trend from the original series and then smooth out irregular component. The seasonal values are collected and summarized to produce a number (generally an *index number*) for each observed interval of the year (week, month, quarter, and so on).

Thus the identification of the seasonal component in a time series differs from trend analysis in at least two ways:

1. The trend is determined directly from the original data, but the seasonal component is determined indirectly after eliminating the other components from the data so that only the seasonality remains.

2. The trend is represented by one best-fitting curve, or equation, but a separate seasonal value has to be computed for each observed interval (week, month, quarter) of the year and is often in the form of an index number.

If an additive decomposition is employed, estimates of the trend, seasonal, and irregular components are added together to produce the original series. If a

multiplicative decomposition is used, the individual components must be multiplied together to reconstruct the original series, and in this formulation, the seasonal component is represented by a collection of index numbers. These numbers show which periods within the year are relatively low and which periods are relatively high. The seasonal indices trace out the seasonal pattern.

With monthly data, for example, a seasonal index of 1.0 for a particular month means the expected value for that month is 1/12 the total for the year. An index of 1.25 for a different month implies the observation for that month is expected to be 25% more than 1/12 of the annual total. A monthly index of 0.80 indicates that the expected level of activity that month is 20% less than 1/12 of the total for the year, and so forth. The index numbers indicate the expected ups and downs in levels of activity over the course of a year after the effects due to the trend (or trend-cycle) and irregular components have been removed[72].

3.5.3 Seasonally Adjusted Data

After the seasonal component has been isolated, it can be used to calculate *seasonally adjusted data*. For an additive decomposition, the seasonally adjusted data are computed by subtracting the seasonal component

$$Y_t - S_t = T_t + I_t$$

For a multiplicative decomposition, the seasonally adjusted data are computed by dividing the original observations by the seasonal component

$$\frac{Y_t}{S_t} = T_t \times I_t \qquad (3.30)$$

[72] Hanke and Wichern, p.167-168.

3.5.3.1 Cyclical and Irregular Variations

Cycles are long-run, wavelike fluctuations that occur most frequently in macro indicators of economic activity. To the extent that they can be measured, cycles do not have a consistent pattern. However, some insight into the cyclical behavior of a time series can be obtained by eliminating the trend and seasonal components to give, using a multiplicative decomposition.

$$\frac{Y_t}{T_t \times S_t} = \frac{T_t \times C_t \times S_t \times I_t}{T_t \times S_t} = C_t \times I_t \qquad (3.31)$$

A moving average can be used to smooth out irregularities, I_t, leaving the cyclical component, C_t. To eliminate the centering problem encountered when a moving average with an even number of time periods is used, the irregularities are smoothed using a moving average with an odd number of time periods. For monthly data, a 5-, 7-, 9-, or even an 11- period moving average will work. For quarterly data, an estimate of C can be computed using a three-period moving average of the values.

Finally, the irregular component is estimated by

$$I_t = \frac{C_t \times I_t}{C_t} \qquad (3.32)$$

The irregular component represents the variability in the time series after the other components have been removed. It is sometimes called the *residual*, or *error*. With a multiplicative decomposition, both the cyclical and irregular components are expressed as indices.

One reason for decomposing a time series is to isolate and examine the components of the series. After the analyst is able to look at the trend, seasonal, cyclical, and irregular components of a series one at a time, insights into the patterns in the original data values may be gained. Also, once the components have been isolated,

they may be recombined or synthesized to produce forecasts of future values of the time series[73].

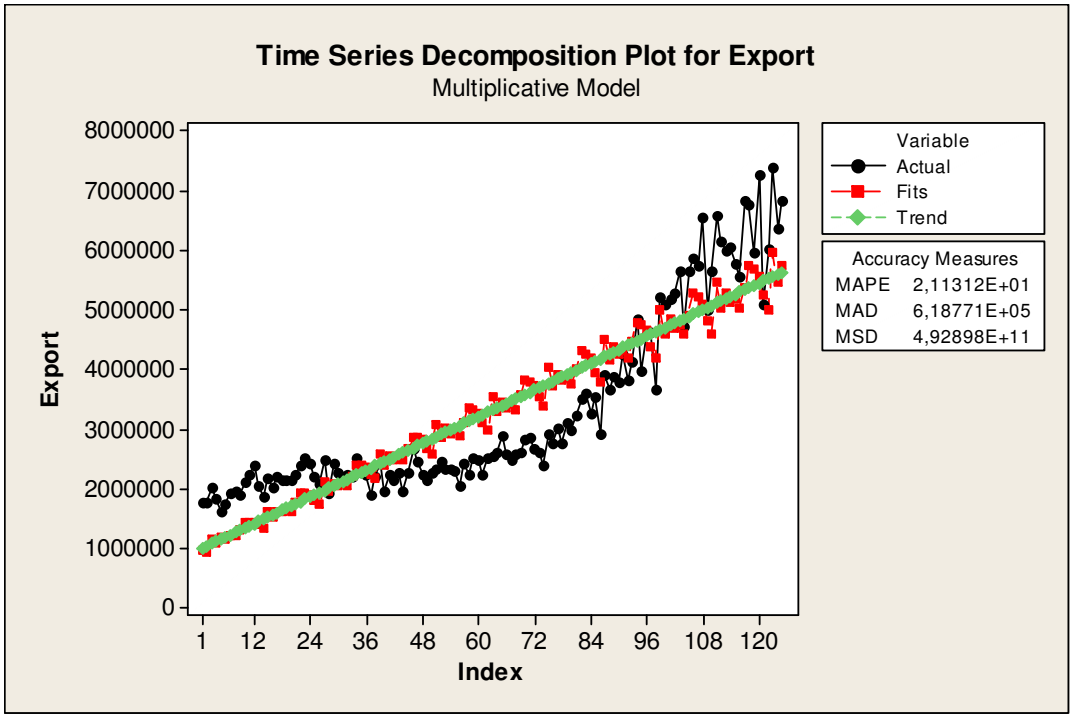

Figure 3-27 Time Series Decomposition- Multiplicative Model- for Export Data

[73] Hanke and Wichern, p.171-172.

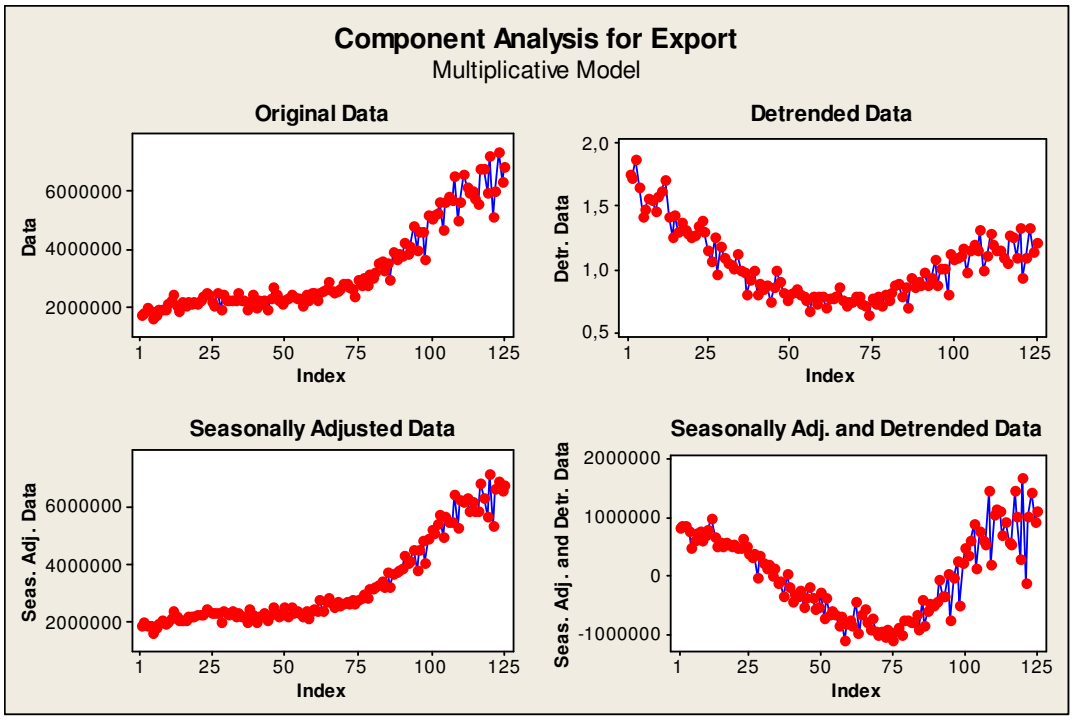

Figure 3-28 Component Analysis- Multiplicative Model- for Export Data

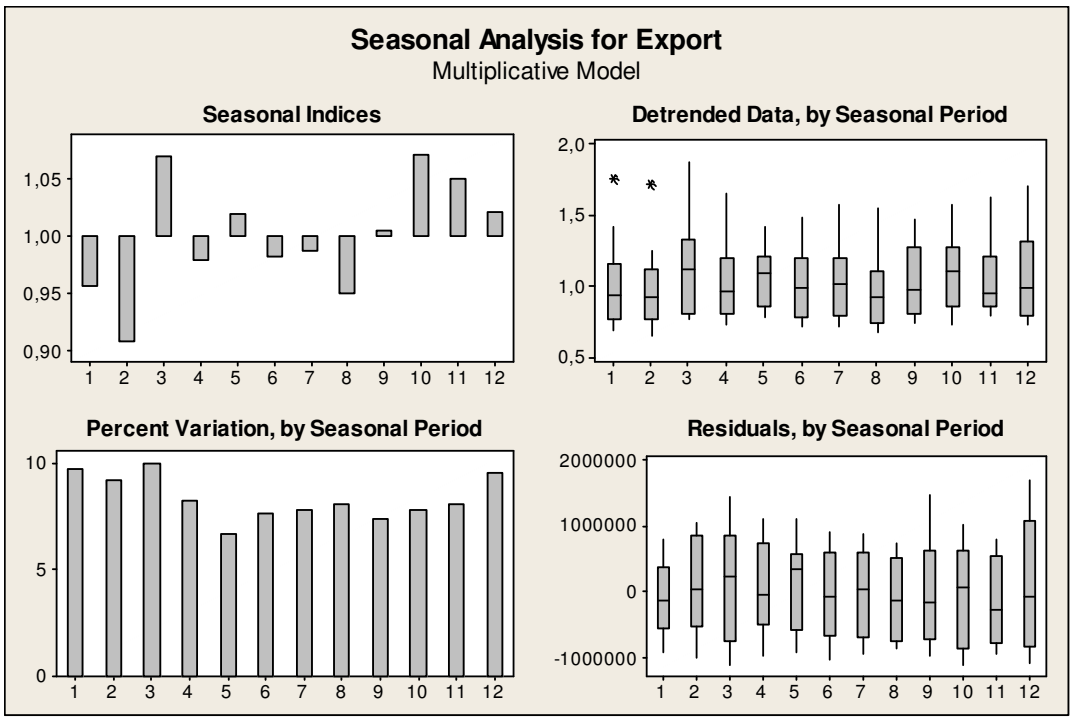

Figure 3-29 Seasonal Analysis- Multiplicative Model- for Export Data

Time Series Decomposition for Export: Multiplicative Model

Fitted Trend Equation

$$Yt = 954934 + 37386{,}0*t$$

Seasonal Indices

Period	Index
1	0,95568
2	0,90715
3	1,07089
4	0,97864
5	1,01965
6	0,98278
7	0,98667
8	0,94999
9	1,00531
10	1,07173
11	1,04999
12	1,02151

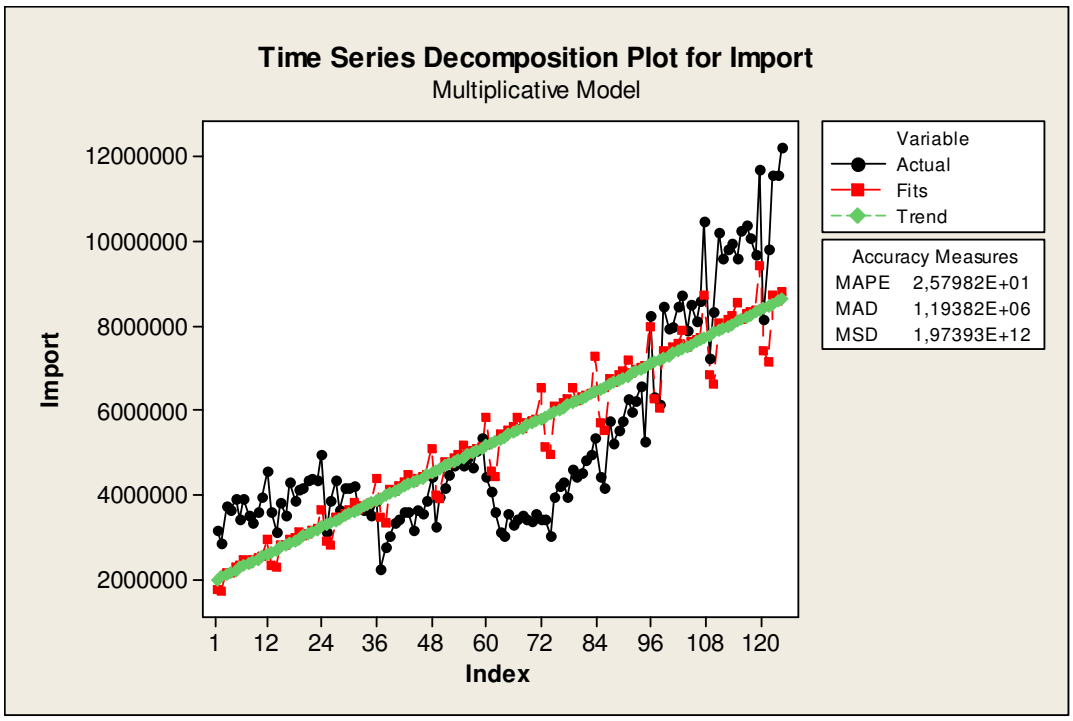

Figure 3-30 Time Series Decomposition- Multiplicative Model- for Import Data

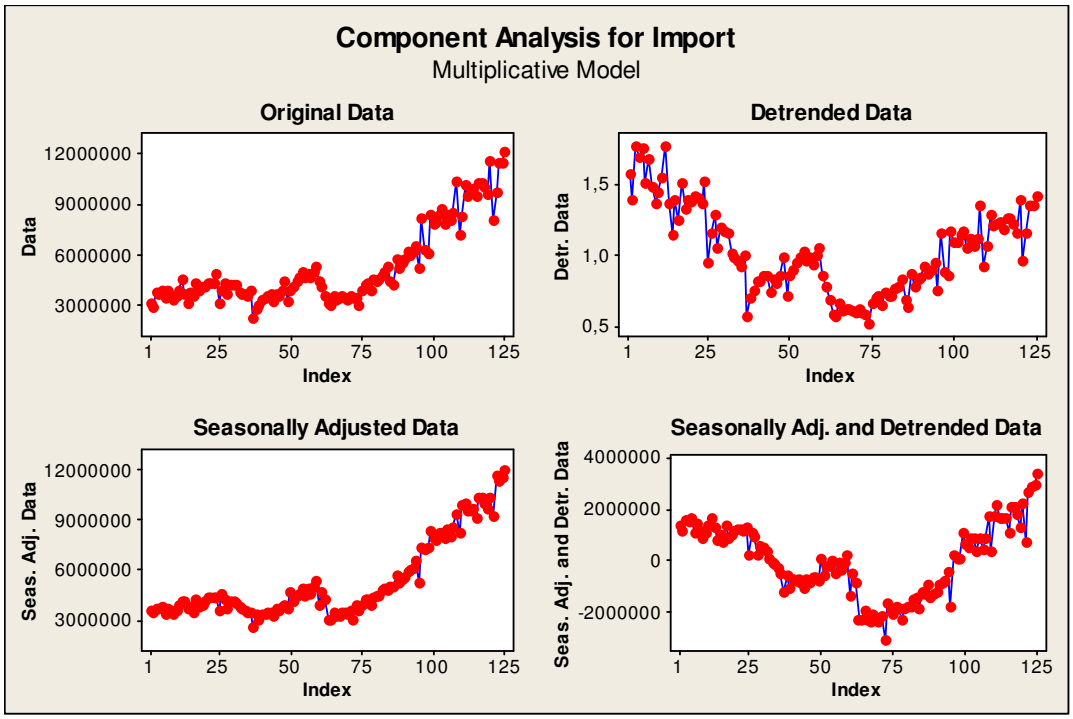

Figure 3-31 Component Analysis- Multiplicative Model- for Import Data

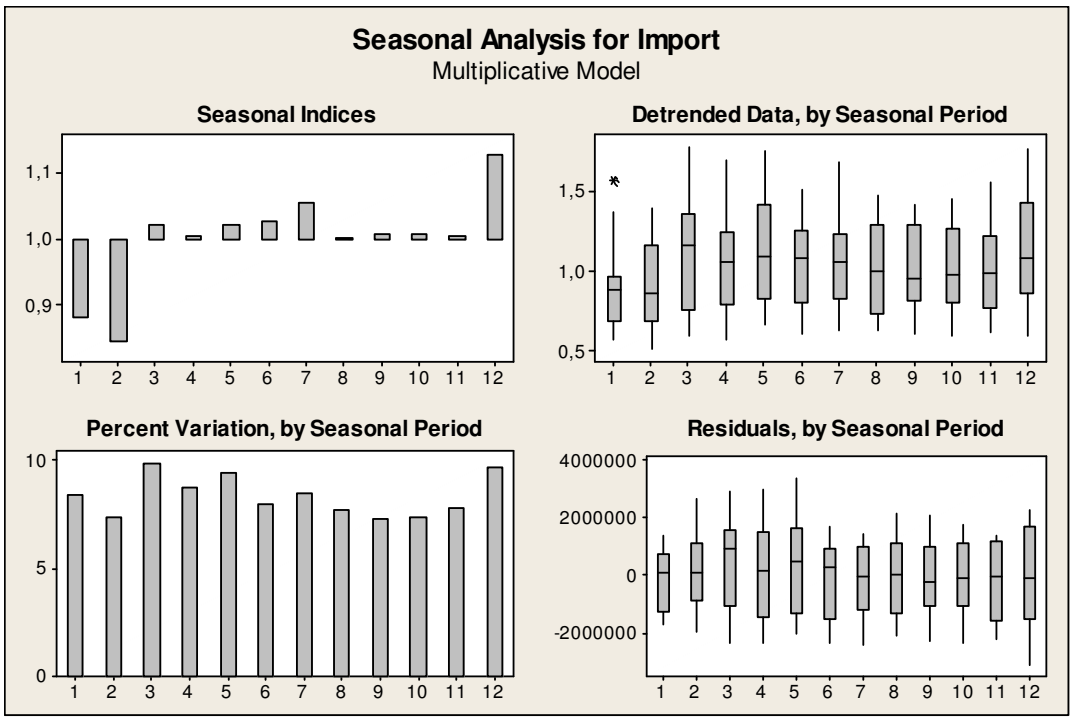

Figure 3-32 Seasonal Analysis- Multiplicative Model- for Import Data

Time Series Decomposition for Import: Multiplicative Model

Fitted Trend Equation

$$Yt = 1948451 + 53445{,}1*t$$

Seasonal Indices

Period	Index
1	0,87837
2	0,84321
3	1,02107
4	1,00336
5	1,02268
6	1,02582
7	1,05577
8	1,00032
9	1,00829
10	1,00714
11	1,00538
12	1,12858

3.6 The Box-Jenkins (ARIMA) Methodology

Autoregressive integrated moving average (ARIMA) models are a class of linear models that is capable of representing *stationary* as well as *nonstationary* time series. ARIMA models do not involve independent variables in their construction. Rather, they make use of the information in the series itself to generate forecasts.

ARIMA models rely heavily on autocorrelation patterns in the data. The methodology for identifying, fitting, and checking appropriate ARIMA models was greatly advanced by the work of two statisticians, G.E.P. Box and G.M Jenkins. For this reason, ARIMA modeling and forecasting is often referred to as the Box-Jenkins methodology[74].

3.6.1 Box-Jenkins Methodology

The *Box-Jenkins methodology* of forecasting is different from most methods because it does not *assume* any particular pattern in the historical data of the series to be forecast. It uses an iterative approach of identifying a possible model from a general class of models. The chosen model is then checked against the historical data to see whether it accurately describes the series. The model fits well if the residuals are generally small, randomly distributed, and contain no useful information. If the specified model is *not* satisfactory, the process is repeated using a new model designed to improve on the original one. This iterative procedure continues until a satisfactory model is found. At that point, the model can be used for forecasting. Figure 3-31 illustrates the Box-Jenkins model-building strategy.

[74] Hanke and Wichern, p.381.

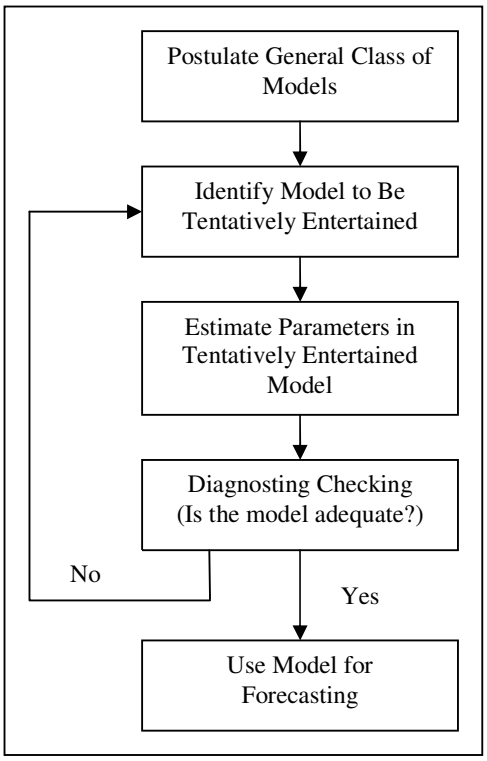

Figure 3-33 Flow Diagram for the Box-Jenkins Model-Building Strategy

Source: Box, G. E. P., Jenkins, G. M., and G. C. Reinsel, **Time Series Analysis: Forecasting and Control** (3rd ed.), Upper Saddle River, New Jersey: Prentice Hall, 1994, p.17.

The initial selection of an ARIMA model is based on an examination of a plot of the time series (to observe its general character) and an examination of its autocorrelations for several time lags. Specifically, the pattern of sample autocorrelations calculated from the time series is matched with the known autocorrelation pattern associated with a particular ARIMA model. Theoretical autocorrelation coefficients for some of the more common ARIMA models are shown in Figures 3-34 and 3-35.

In selecting a model, it should be remembered that the autocorrelations calculated from the data will not exactly match any set of theoretical autocorrelations associated with an ARIMA model. Autocorrelations calculated from the data are subject to sampling variation. However, most time series data should be able to

adequately be matched with an ARIMA model. If the initial selection is not quite right, inadequacies will show up in an analysis of the residuals (model checking), and the original model can be modified[75].

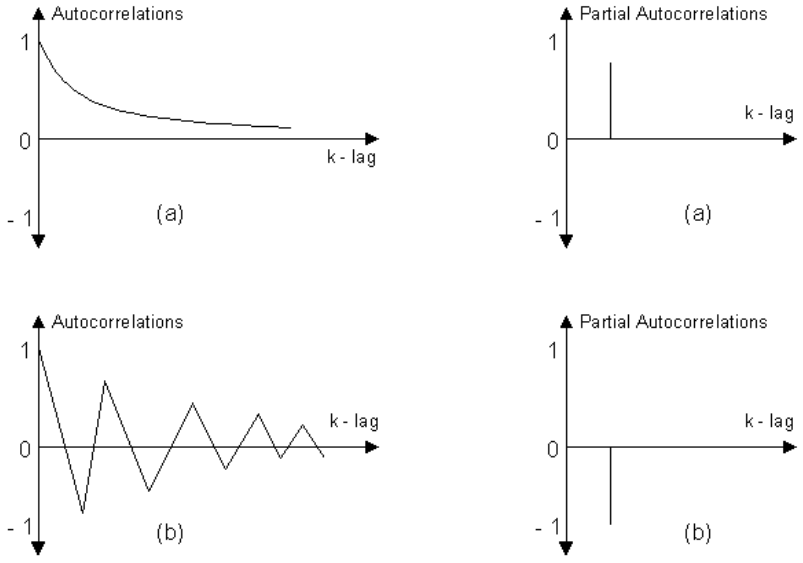

Figure 3-34 Behavior of the Autocorrelations and Partial Autocorrelations of AR(1)

[75] Hanke and Wichern, p.381-385.

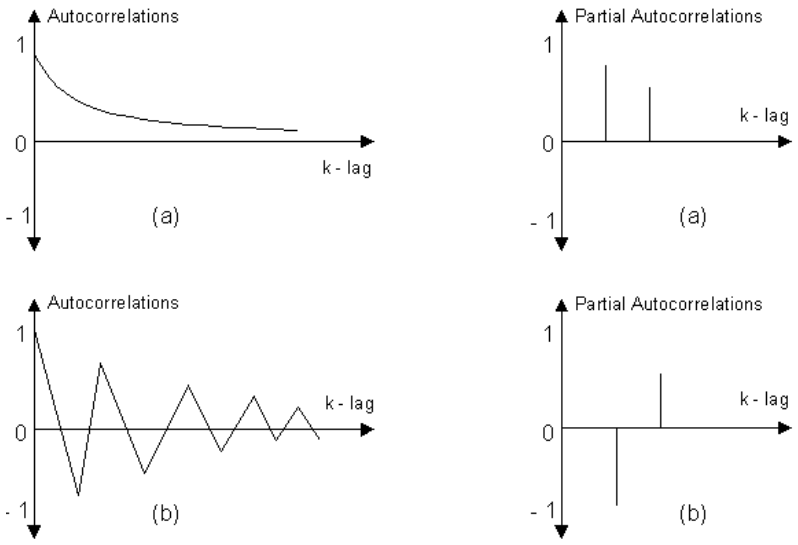

Figure 3-35 Behavior of the Autocorrelations and Partial Autocorrelations of AR(2)

3.6.1.1 Autoregressive Models

A p th-order autocorrelation autoregressive model takes the form

$$Y_t = \phi_0 + \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + ... + \phi_p Y_{t-p} + \varepsilon_t \qquad (3.33)$$

where

Y_t = response (dependent) variable at time t

$Y_{t-1}, Y_{t-2}, ..., Y_{t-p}$ = response variable at time lags $t-1, t-2, ..., t-p,$ respectively; these Y's play the role of independent variables

$\phi_0, \phi_1, \phi_2, ..., \phi_p$ = coefficients to be estimated

ε_t = error term at time t that represents the effects of variables not explained by the model; the assumptions about the error term are the same as those for the standard regression model

The model in Equation 3.33 has the appearance of a regression model with lagged values of the dependent variable in the independent variable positions, hence the name *autoregressive model*. Autoregressive models are appropriate for stationary time series, and the coefficient ϕ_0 is related to the constant level of the series. If the data vary about zero or are expressed as deviations from the mean $Y_t - \overline{Y}$, the coefficient ϕ_0 is not required.

The equations of an AR model of order 1, AR(1) model, and of order 2, AR(2) model are shown in Figure 3-34. Figure 3-34 (a) and (b) illustrate the behavior of the theoretical autocorrelation and partial autocorrelation functions for an AR (1) model. Notice how differently the autocorrelation and partial autocorrelation functions behave. The autocorrelation coefficient trail off to zero gradually, whereas the partial autocorrelation coefficients drop to zero after the first time lag. Figure 3-35 (a) and (b) show the autocorrelations for an AR (2) model. Again, the autocorrelation coefficients trail off to zero, whereas the partial autocorrelation coefficients drop to zero after the second time lag. This type of pattern will generally hold for any AR (p) model. It must be remembered that sample autocorrelation functions are going to differ from these theoretical functions because of sampling variation[76].

3.6.1.2 Moving Average Models

A q th-order moving average model takes the form

$$Y_t = \mu + \varepsilon_t - \omega_1\varepsilon_{t-1} - \omega_2\varepsilon_{t-2} - ... - \omega_q\varepsilon_{t-q} \qquad (3.34)$$

where

Y_t = response (dependent) variable at time t

μ = constant mean of the process

$\omega_1, \omega_2, ..., \omega_q$ = coefficients to be estimated

ε_t = error term at time t that represents the effects of variables not

[76] Hanke and Wichern, p.386.

explained by the model; the assumptions about the error term are the same as those for the standard regression model

$\varepsilon_{t-1}, \varepsilon_{t-2}, ..., \varepsilon_{t-q}$ = errors in previous time periods that, at time t, are incorporated in the response Y_t

Equation 3.34 is similar to Equation 3.33 except that the dependent variable Y_t depends on previous values of the errors rather than on the variable itself. Moving average (MA) models provide forecasts of Y_t based on a linear combination of a finite number of past errors, whereas autoregressive (AR) models forecast Y_t as a linear function of a finite number of past values of Y_t.

The term *moving average* for the model in Equation 3.34 is historical and should not be confused with the moving average procedures. Here *moving average* refers to the fact that the deviation of the response from its mean, $Y_t - \mu$, is a linear combination of current and past errors, and as time moves forward, the errors involved in this linear combination move forward as well.

$$Y_t - \mu = \varepsilon_t - \omega_1 \varepsilon_{t-1} - \omega_2 \varepsilon_{t-2} - ... - \omega_q \varepsilon_{t-q}$$

$$Y_{t+1} - \mu = \varepsilon_{t+1} - \omega_1 \varepsilon_t - \omega_2 \varepsilon_{t-1} - ... - \omega_q \varepsilon_{t-q+1}$$

The weights $\omega_1, \omega_2, ..., \omega_q$ do not necessarily sum to 1 and may be positive or negative, although they are each preceded by a minus sign in the specification of the model.

The autocorrelation coefficients for the MA(1) model drop to zero after the first time lag, whereas the partial autocorrelation coefficients trail off to zero gradually. Furthermore, the autocorrelation coefficients for the MA(2) model are zero after the second time lag, whereas the partial autocorrelations trail off gradually[77].

[77] Hanke and Wichern, p.387-388.

3.6.1.3 Autoregressive Moving Average Models

A model with autoregressive terms can be combined with a model having moving average terms to get a "mixed" autoregressive-moving average model. It is convenient to use the notation ARMA (p,q), where p is the order of the autoregressive part and q is the order of the moving average part, to represent these models. An ARMA (p,q) model has the general form

$$Y_t = \phi_0 + \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + ... + \phi_p Y_{t-p} + \varepsilon_t - \omega_1 \varepsilon_{t-1} - \omega_2 \varepsilon_{t-2} - ... - \omega_q \varepsilon_{t-q} \quad (3.35)$$

ARMA (p,q) models can describe a wide variety of behaviors for stationary time series. Forecast generated by an ARMA (p,q) model will depend on current and past values of the response Y as well as current and past values of the errors (residuals) e [78].

3.6.2 Implementing the Model-Building Strategy

As shown in Figure 3-33, the Box-Jenkins approach uses an iterative model-building strategy that consists of selecting an initial model (model identification), estimating the model coefficients (parameter estimation), and analyzing the residuals (model checking). If necessary, the initial model is modified and the process is repeated until the residuals indicate no further modification is necessary. At this point, the fitted model can be used for forecasting.

The steps in the model-building strategy are examined in some detail next.

3.6.2.1 Step 1: Model Identification

1. The first step in model identification is to determine whether the series is stationary, that is, whether the time series appears to vary about a fixed level. It is useful to look at a plot of the series along with the sample autocorrelation function. A

[78] Hanke and Wichern, p.388-389.

nonstationary time series is indicated if the series appears to grow or decline over time and the sample autocorrelations fail to die out rapidly.

If the series is not stationary, it can often be converted to a stationary series by differencing. That is, the original series is replaced by a series of differences. An ARMA model is then specified for the differenced series. In effect, the analyst is modeling changes rather than levels.

As an example, suppose the original series Y_t is generally increasing over time, but the first differences $\Delta Y_t = Y_t - Y_{t-1}$ vary about a fixed level. It may be appropriate to model the stationary differences using an ARMA model of, say, order $p = 1$ and $q = 1$. In this case, the model is

$$\Delta Y_t = \phi_1 \Delta Y_{t-1} + \varepsilon_t - \omega_1 \varepsilon_{t-1}$$

or

$$(Y_t - Y_{t-1}) = \phi_1 (Y_{t-1} - Y_{t-2}) + \varepsilon_t - \omega_1 \varepsilon_{t-1}$$

In some cases, it may be necessary to difference the differences before stationary data are obtained. Simple differencing is done twice and stationary data are

$$\Delta^2 Y_t = \Delta(\Delta Y_t) = \Delta(Y_t - Y_{t-1}) = Y_t - 2Y_{t-1} + Y_{t-2}$$

Differencing is done until a plot of the data indicates the series varies about a fixed level, and the sample autocorrelations die out fairly rapidly. The number of differences required to achieve stationary is denoted by d.

Models for nonstationary series are called autoregressive *integrated* moving average models and denoted by ARIMA(p,d,q). Here p indicates the order of the autoregressive part, d indicates the amount of differencing, and q indicates the order of the moving average part. If the original series is stationary, $d = 0$ and the ARIMA models reduce to the ARMA models. Consequently, from this point on, the

ARIMA(p,d,q) notation is used to indicate models for both stationary $(d=0)$ and nonstationary $(d>0)$ time series.

Although ARIMA models involve differences, forecasts for the original series can always be computed directly from the fitted model.

2. Once a stationary series has been obtained, the analyst must identify the form of the model to be used.

This second part of step 1 is accomplished by comparing the autocorrelations and partial autocorrelations computed from the data to the theoretical autocorrelations and partial autocorrelations for the various ARIMA models.

Each ARIMA model has a unique set of autocorrelations and partial autocorrelations, and the corresponding sample values should be able to be matched to one of the theoretical patterns.

There may be some ambiguity in determining an appropriate ARIMA model from the patterns of the sample autocorrelations and partial autocorrelations. Thus the initial model selection should be regarded as tentative. Analyses can be done during Steps 2 and 3 to determine if the model is adequate. If not, an alternative model can be tried.

If sample autocorrelations die out exponentially to zero and sample partial autocorrelations cut off, the model will require autoregressive terms. If the sample autocorrelations cut off and the sample partial autocorrelations die out, the model will require moving average terms. If both sample autocorrelations and sample partial autocorrelations die out, both autoregressive and moving average terms are indicated. By counting the number of significant sample autocorrelations and partial autocorrelations, the orders of the MA and AR parts can be determined. To judge their significance, both the sample autocorrelations and sample partial autocorrelations are usually compared with $\pm 2/\sqrt{n}$ where n is the number of observations in the time series. These limits work well when n is large.

All things being equal, simple models are preferred to complex models. This is known as the *principle of parsimony*. With a limited amount of data, it is relatively easy to find a model with a large number of parameters that fits the data well. However, forecasts from such a model are likely to be poor because much of the variation in the data due to random error is being modeled. The goal is to develop the simplest model that provides an adequate description of the major features of the data.

3.6.2.2 Step 2: Model Estimation

1. Once a tentative model has been selected, the parameters for that model must be estimated.

The parameters in ARIMA models are estimated by minimizing the sum of squares of the fitting errors. These least squares estimates must, in general, be obtained using a nonlinear least squares procedure. A nonlinear least squares procedure is simply an algorithm that finds the minimum of the sum of squared errors function. After the least squares estimates and their standard errors are determined, t values can be constructed and interpreted in the usual way. Parameters that care judged significantly different from zero are retained in the fitted model; parameters that are not significant are dropped from the model.

2. In addition, the *residual mean square error*, an estimate of the variance of the error ε_t, is computed.

The residual mean square error is defined as

$$s^2 = \frac{\sum_{t=1}^{n} e_t^2}{n-r} = \frac{\sum_{t=1}^{n} (Y_t - \hat{Y}_t)^2}{n-r} \qquad (3.36)$$

where

$\varepsilon_t = Y_t - \hat{Y}_t =$ the residual at time t

$n =$ the number of residuals

$r =$ the total number of parameters estimated

The residual mean square error is useful for assessing fit and comparing different models. It is also used to calculate forecast error limits.

3.6.2.3 Step 3: Model Checking

Before using the model for forecasting, it must be checked for adequacy. Basically, a model is adequate if the residuals cannot be used to improve the forecasts. That is, the residuals should be random.

1. Many of the same residual plots that are useful in regression analysis can be developed for the residuals from an ARIMA model. A histogram and a normal probability plot (to check for normality) and time sequence plot (to check for outliers) are particularly helpful.

2. The individual residual autocorrelations should be small and generally within $\pm 2/\sqrt{n}$ of zero. Significant residual autocorrelations at low lags or seasonal lags suggest the model is inadequate and a new or modified model should be selected.

3. The residual autocorrelations as a group should be consistent with those produced by random errors.

An overall check of model adequacy is provided by a chi-square (χ^2) test based on the Ljung-Box Q statistic. This test looks at the sizes of the residual autocorrelations as a group. The test statistic Q is

$$Q_m = n(n+2)\sum_{k=1}^{m} \frac{r_k^2(e)}{n-k} \qquad (3.37)$$

which is approximately distributed as s chi-square random variable with $m-r$ degrees of freedom, where r is the total number of parameters estimated in the ARIMA model.

In Equation 3.37,

$r_k(e) =$ the residual autocorrelation at lag k

$n =$ the number of residuals

$k =$ the time lag

$m =$ the number of time lags to be tested

If the p-value associated with the Q statistic is small (say, p-value $< .05$), the model is considered inadequate. The analyst should consider a new or modified model and continue the analysis until a satisfactory model has been determined.

Judgment plays a large role in the model-building effort. Two simple competing models may adequately describe the data, and a choice may be made on the basis of the nature of the forecast. In addition, a few large residuals may be ignored if they can be explained by unusual circumstances, and the model is adequate for the remainder of the observations.

3.6.2.4 Step 4: Forecasting with the Model

1. After an adequate model has been found, forecasts for one period or several periods into the future can be made.

Prediction intervals based on the forecasts can also be constructed. In general, for a given confidence level, the longer the forecast lead time, the larger the prediction interval. This is sensible because the uncertainty is expected to be greater for a forecast of a distant value than it is for a forecast of, say, the next observation. Calculating forecasts and prediction intervals is tedious and best left to the computer. Computer programs that fit ARIMA models generate forecasts and prediction intervals at the analyst's request.

2. As more data become available, the same ARIMA model can be used to generate revised forecasts from another time origin.

3. If the pattern of the series appears to be changing over time, the new data may be used to re-estimate the model parameters or, if necessary, to develop an entirely new model.

It is a good idea to monitor the forecast errors. If the magnitudes of the most recent errors tend to be consistently larger than previous errors, it may be time to reevaluate the model. At this point, another iteration of the model-building strategy may be required. The same holds true if the recent forecast errors tend to be consistently positive (underpredicting) or negative (overpredicting)[79].

3.6.2.5 Final Comments

In ARIMA modeling, it is not good practice to include AR and MA parameters to cover all the possibilities suggested by the sample autocorrelation and sample partial autocorrelation functions. That is, when in doubt, start with a model containing few rather than many parameters. The need for additional parameters will be evident from an examination of the residual autocorrelations and partial autocorrelations. If MA behavior is apparent in the residual autocorrelations and partial autocorrelations, add an MA parameter and fit the revised model. If the residual autocorrelations look like those of an AR process, add an AR term and refit the model.

Least squares estimates of autoregressive and moving average parameters in ARIMA models tend to be highly correlated. When there are more parameters than necessary, this leads to tradeoffs among the parameters and unstable models that can produce poor forecasts.

To summarize, it is good practice to start with a small number of clearly justifiable parameters and add one parameter at a time as needed. On the other side, if

[79] Hanke and Wichern, p.389-396.

parameters in a fitted ARIMA model are not significant (as judged by their t ratios), delete one parameter at a time and refit the model. Because of the high correlation among estimated parameters, it may be the case that a previously nonsignificant parameter becomes significant[80].

3.6.2.6 Model Selection Criteria

ARIMA models are identified (selected) by looking at a plot of the series and by matching sample autocorrelation and sample partial autocorrelation patterns with the known theoretical patterns of ARIMA processes. However, there is some subjectivity involved in this procedure, and it is possible that two (or more) initial models may be consistent with the patterns of the sample autocorrelations and partial autocorrelations. Moreover, after estimation and checking, both models may adequately represent the data. If the models contain the same number of parameters, the model with the smallest mean square error s^2 is ordinarily preferred. If the models contain different numbers of parameters, the parsimony principle leads to the selection of the simpler model. However, the model with more parameters may have an appreciably smaller mean square error.

An approach to model selection that considers both the model fit and the number of parameters has been developed. The information criterion of Akaike, or *AIC*, selects the best model from a group of candidate models as the one that minimizes

$$AIC = \ln \hat{\sigma}^2 + \frac{2}{n} r \qquad (3.38)$$

where

ln = the natural log

$\hat{\sigma}^2$ = the residual sum of squares divided by the number of observations

n = the number of observations (residuals)

r = the total number of parameters (including the constant term) in the ARIMA model

[80] Hanke and Wichern, p.411.

The Bayesian information criterion developed by Schwarz, or *BIC*, selects the model that minimizes

$$BIC = \ln \hat{\sigma}^2 + \frac{\ln n}{n} r \qquad (3.39)$$

The second term in both *AIC* and *BIC* is a "penalty factor" for including additional parameters in the model. Because the *BIC* criterion imposes a greater penalty for the number of parameters than does the *AIC* criterion, use of minimum *BIC* for model selection will result in a model whose number of parameters is no greater than that chosen by *AIC*. Often, the two criteria produce the same result.

AIC and *BIC* should be viewed as additional procedures to assist in a model selection. They should not be used as substitutes for a careful examination of the sample autocorrelations and partial autocorrelations[81].

3.6.2.7 Models for Seasonal Data

Seasonal data have a distinct pattern that repeats itself every year. For monthly data with an annual seasonal pattern, observations for the same months in different years should be correlated. Not only are observations within the year related to one another (correlated), observations between years are related to one another (correlated). If the length of the seasonal period is S, so that S=12 for monthly data and S=4 for quarterly data, the autocorrelations and partial autocorrelations for seasonal processes are nonzero at low lags (within-year association) and at lags that are multiples of seasonal period as (between-year association). The interpretations of the autocorrelations and partial autocorrelations at the seasonal lags are the same as the interpretation of the autocorrelations and partial autocorrelations at low lags. Seasonal ARIMA models contain regular autoregressive and moving average terms that account for the correlation at low lags and seasonal autoregressive and moving average terms that account for the correlation at the seasonal legs. In addition, for nonstationary

[81] Hanke and Wichern, p.412-413.

seasonal series, an additional seasonal difference is often required to completely specify the model[82].

3.6.2.8 Simple Exponential Smoothing and ARIMA Model

Several ARIMA models produce forecasts that are the same or nearly the same as the smoothing methods discussed previously. To illustrate one case, consider the ARIMA (0,1,1) model

$$Y_t - Y_{t-1} = \varepsilon_t - \omega_1 \varepsilon_{t-1} \qquad (3.40)$$

Suppose the forecast origin is t and a forecast of Y_{t+1} is required. Substituting $t+1$ for t in Equation 3.40 and solving for Y_{t+1} gives

$$Y_{t+1} = Y_t + \varepsilon_{t+1} - \omega_1 \varepsilon_t$$

Because at time t, the best guess of ε_{t+1} is zero, and ε_t is estimated by the residual $\varepsilon_t = Y_t - \hat{Y}_t$, the forecasting equation is

$$\hat{Y}_{t+1} = Y_t - \omega_1 (Y_t - \hat{Y}_t) = (1-\omega_1) Y_t + \omega_1 \hat{Y}_t \qquad (3.41)$$

Let $\alpha = 1 - \omega_1$, and Equation 3.41 is identical to the simple exponential smoothing Equation 3.23

$$\hat{Y}_{t+1} = \alpha Y_t + (1-\alpha)\hat{Y}_t$$

Forecasting using simple exponential smoothing is equivalent to generating forecasts using an ARIMA (0,1,1) model with parameter $\omega_1 = 1 - \alpha$. Note that ARIMA (0,1,1) model represents a nonstationary process. Simple exponential smoothing should work well for those time series that can be adequately described by an ARIMA (0,1,1)

[82] Hanke and Wichern, p.414.

model. For those time series that cannot be adequately described by this model, forecasts generated by exponential smoothing may not be particularly good.

For simple exponential smoothing, the parameter α is usually restricted to the range $0 < \alpha < 1$. The moving average parameter ω_1 in the ARIMA (0,1,1) model is restricted to the range $-1 < \omega_1 < 1$ so, strictly speaking, the two forecasting methods are equivalent for positive values of the parameters α and ω_1 [83].

3.6.2.9 Advantages and Disadvantages of ARIMA Models

The Box-Jenkins approach to time series analysis is a very powerful tool for providing accurate short-range forecasts. ARIMA models are quite flexible and can represent a wide range of characteristics of time series that occur in practice. Formal procedures for testing the adequacy of the model are available. Moreover, forecasts and prediction intervals follow directly from the fitted model.

However, ARIMA modeling has some drawbacks.

1. A relatively large amount of data is required. It should be recognized that if the data are seasonal with, say, a seasonal period of $S = 12$, then monthly observations for one year essentially constitute one data point (one look at the seasonal pattern), not twelve. Generally speaking, for nonseasonal data, about 40 observations or more are required to develop an ARIMA model. For seasonal data, about six to ten years of data–depending on the length of the seasonal period–are required to construct an ARIMA model.

2. There are no easy ways to update the parameters of an ARIMA model as new data become available, as there are in some smoothing methods. The model has to be periodically completely refitted, and, sometimes, a new model must be developed.

3. The construction of a satisfactory ARIMA model often requires a large investment of time and other resources. The costs of model development,

[83] Hanke and Wichern, p.424-426.

computer run time, and storage requirements can be substantially higher for ARIMA models than for the more traditional forecasting techniques such as smoothing[84].

Model Description

Model Summary for Exports
Model Type
ARIMA (0,1,1)(0,1,0)

Model Fit

					Percentile						
Fit Statistic	Mean	SE	Minimum	Maximum	5	10	25	50	75	90	95
Stationary R-square	,423	.	,423	,423	,423	,423	,423	,423	,423	,423	,423
R-squared	,962	.	,962	,962	,962	,962	,962	,962	,962	,962	,962
RMSE	303566,6	.	303566,6	303566,6	303566,6	303566,6	303566,6	303566,6	303566,6	303566,6	303566,6
MAPE	6,399	.	6,399	6,399	6,399	6,399	6,399	6,399	6,399	6,399	6,399
MaxAPE	23,938	.	23,938	23,938	23,938	23,938	23,938	23,938	23,938	23,938	23,938
MAE	221528,0	.	221528,0	221528,0	221528,0	221528,0	221528,0	221528,0	221528,0	221528,0	221528,0
MaxAE	1168441	.	1168441	1168441	1168441	1168441	1168441	1168441	1168441	1168441	1168441
Normalized BIC	25,289	.	25,289	25,289	25,289	25,289	25,289	25,289	25,289	25,289	25,289

Model Statistics

		Model Fit statistics	Ljung-Box Q(18)			
Model	Number of Predictors	Stationary R-squared	Statistics	DF	Sig.	Number of Outliers
EXPORT-Model_1	0	,423	23,814	17	,125	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
EXPORT-Model_	Forecast	6625554	6350486	6139887	7401289	7359199	6529423	7832957	5684424	6599453	7967075	6960783	7424894
	UCL	7226492	6976901	6790782	8075776	8056480	7248776	8573725	6446005	7381293	8768663	7781643	8264584
	LCL	6024615	5724071	5488992	6726802	6661918	5810070	7092189	4922843	5817612	7165487	6139923	6585204

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of available or at the end date of the requested forecast period, whichever is earlier.

Table 3-13 ARIMA Model for Export Data

[84] Hanke and Wichern, p.426-428.

Model Description

Model Summary for Imports
Model Type
ARIMA (2,1,0)(1,0,0)

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,602	.	,602	,602	,602	,602	,602	,602	,602	,602	,602
R-squared	,951	.	,951	,951	,951	,951	,951	,951	,951	,951	,951
RMSE	544072,0	.	544072,0	544072,0	544072,0	544072,0	544072,0	544072,0	544072,0	544072,0	544072,0
MAPE	8,503	.	8,503	8,503	8,503	8,503	8,503	8,503	8,503	8,503	8,503
MaxAPE	36,908	.	36,908	36,908	36,908	36,908	36,908	36,908	36,908	36,908	36,908
MAE	405379,4	.	405379,4	405379,4	405379,4	405379,4	405379,4	405379,4	405379,4	405379,4	405379,4
MaxAE	1989243	.	1989243	1989243	1989243	1989243	1989243	1989243	1989243	1989243	1989243
Normalized BIC	26,530	.	26,530	26,530	26,530	26,530	26,530	26,530	26,530	26,530	26,530

Model Statistics

Model	Number of Predictors	Model Fit statistics	Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	Statistics	DF	Sig.	
IMPORT-Model_1	0	,602	24,588	15	,056	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
IMPORT-Model_1	Forecast	11940925	11758863	12292396	12312137	12127400	11839963	13251152	10753997	11923423	13182673	13168435	13621869
	UCL	12998531	12929199	13575625	13752358	13680168	13499901	15016885	12616449	13878180	15226093	15296477	15831350
	LCL	10883319	10588527	11009166	10871916	10574631	10180025	11485419	8891546	9968666	11139253	11040392	11412387

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predict available or at the end date of the requested forecast period, whichever is earlier.

Table 3-14 ARIMA Model for Import Data

In Tables 3-13 and 3-14 ARIMA models for Turkish Exports and Import are presented. In SPSS 14.0, the Time Series Modeler procedure estimates exponential smoothing, univariate Autoregressive Integrated Moving Average (ARIMA), and multivariate ARIMA (or transfer function models) models for time series, and produces forecasts. The procedure includes an Expert Modeler that automatically identifies and estimates the best-fitting ARIMA or exponential smoothing model for one or more dependent variable series, thus eliminating the need to identify an appropriate model through trial and error.

3.7 Comparison of Forecasting Techniques for Turkish Export and Import Data

In this study several forecasting methods were analyzed for Turkish export and imports. To choose the best model among studied models, it is necessary to compare forecasting errors. The best models that minimize forecasting errors are written in bold letters in Tables 3-15 and 3-16 and those models will be used to determine future values of export and import.

	Comparison of Forecasting Errors of Chosen Methods for Turkish Export Data		
	Error Types		
MODELS	**MAPE**	**MAD**	**MSD**
Naive	9.37	331966	2.45386E+11
Simple Averages	22.85	1021944	2.40626E+12
Moving Averages (MA3)	7.92	277067	1.48301E+11
Moving Averages (MA5)	7.73	281046	1.53712E+11
Double Moving Averages	9.90	333827	2.20836E+11
Single Exponential	7.66	272768	1.54280E+11
Double Exponential (Holt's)	8.21	283938	1.78900E+11
Winters' Multiplicative	**6.21**	**203677**	**7.55421E+10**
Winters' Additive	6.57	214419	8.81491E+10
Linear Trend Model	21.5	633141	5.31162E+11
Quadratic Trend Model	9.75	305640	1.53782E+11
Growth Curve Model	14.06	465312	3.48947E+11
ARIMA	6.40	221528	9.21527E+10

Table 3-15 Comparison of Forecasting Errors of Chosen Methods for Export Data

	Comparison of Forecasting Errors of Chosen Methods for Turkish Import Data		
	Error Types		
MODELS	**MAPE**	**MAD**	**MSD**
Naive	10.87	562255	7.30733E+11
Simple Averages	23.1	1590946	5.93563E+12
Moving Averages (MA3)	9.91	510466	4.99307E+11
Moving Averages (MA5)	10.71	555107	5.50409E+11
Double Moving Averages	11.56	590623	6.90709E+11
Single Exponential	10.01	514860	5.21247E+11
Double Exponential (Holt's)	10.05	504962	5.85284E+11
Winters' Multiplicative	9.29	422361	3.08693E+11
Winters' Additive	9.55	437015	3.48054E+11
Linear Trend Model	26.42	1230620	2.11409E+12
Quadratic Trend Model	15.16	698340	6.88694E+11
Growth Curve Model	20.52	1040640	1.74458E+12
ARIMA	**8.50**	**405379**	**2.96014E+11**

Table 3-16 Comparison of Forecasting Errors of Chosen Methods for Import Data

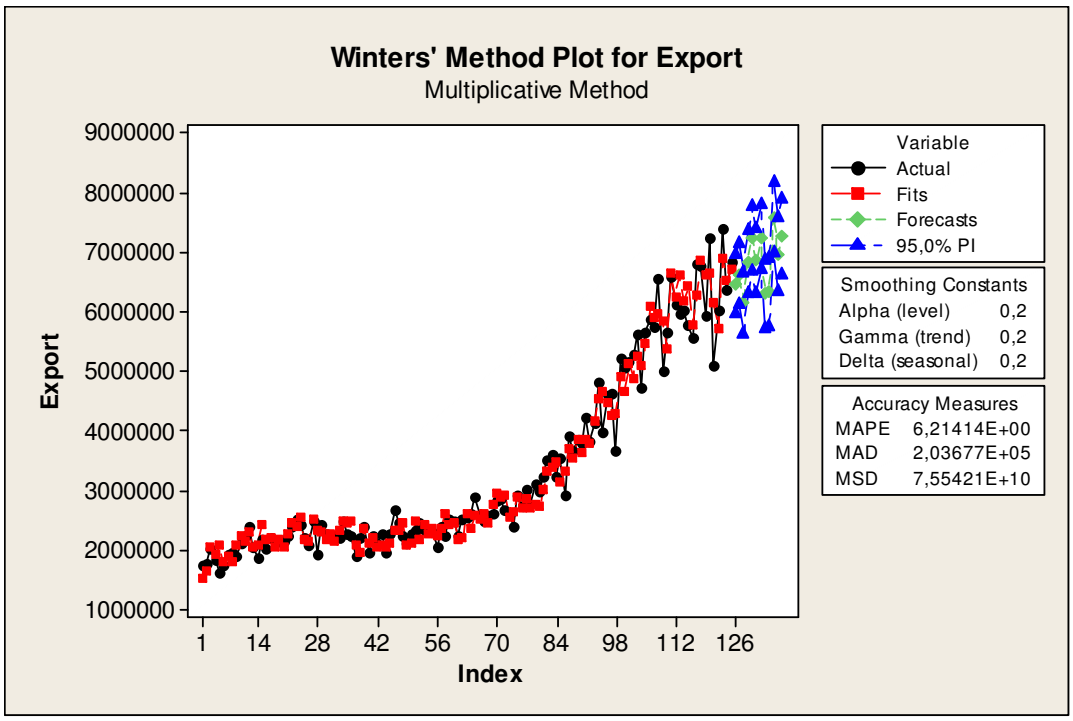

Figure 3-36 Winters' Multiplicative Method Plot for Export Data

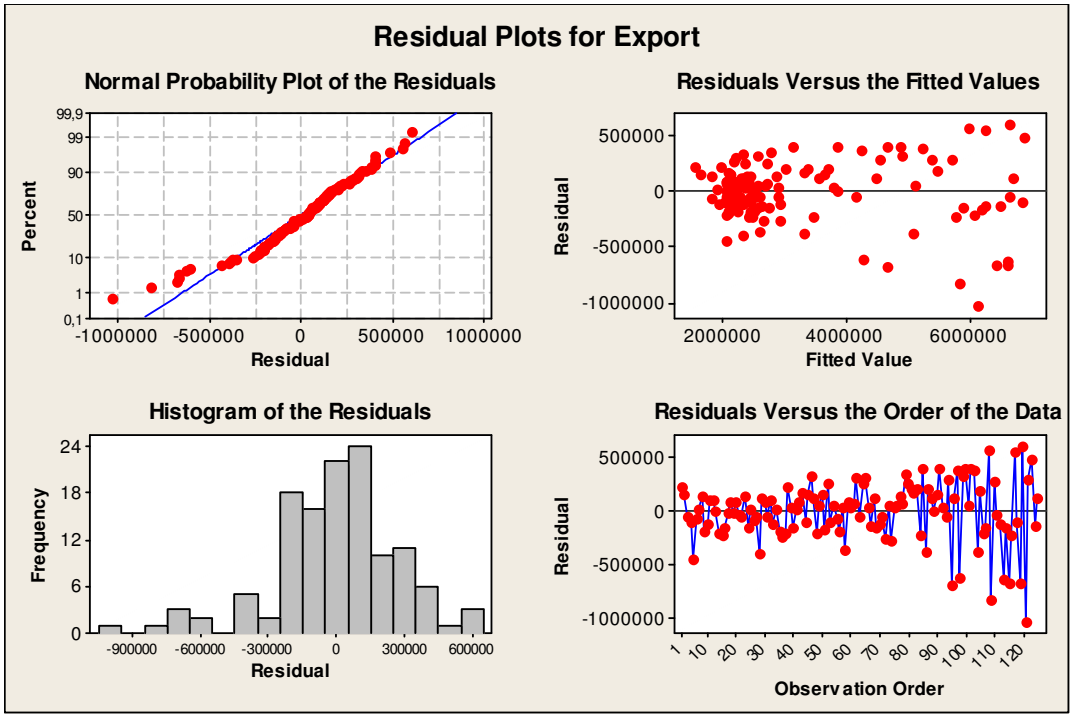

Figure 3-37 Residual Plots Based on Winters' Multiplicative Method for Export Data

Forecasts of Turkish Exports for the next 12 Months Period Based on Winters' Multiplicative Method

Period	Forecast	Lower	Upper
JUN 2006	6472065	5973066	6971064
JUL 2006	6629560	6122743	7136377
AUG 2006	6136031	5620498	6651565
SEP 2006	6835712	6310607	7360816
OCT 2006	7226457	6690972	7761941
NOV 2006	6855074	6308448	7401700
DEC2007	7252593	6694108	7811078
JAN 2007	6290690	5719674	6861706
FEB2007	6324622	5740447	6908798
MAR 2007	7584528	6986605	8182 451
APR 2007	6956148	6343930	7568366
MAY 2007	7256975	6629951	7883998

Table 3-17 Forecasts of Turkish Exports for the next 12 Months Period Based on Winters' Multiplicative Method

Forecasts of Turkish Imports for next 12 Month Period Based on ARIMA(2,1,0)(1,0,0)

Period	Forecast	Lower	Upper
JUN 2006	11940925	10883319	12998531
JUL 2006	11758863	10588527	12929199
AUG 2006	12292396	11009166	13575625
SEP 2006	12312137	10871916	13752358
OCT 2006	12127400	10574631	13680168
NOV 2006	11839963	10180025	13499901
DEC 2006	13251152	11485419	15016885
JAN 2007	10753997	8891546	12616449
FEB 2007	11923423	9968666	13878180
MAR 2007	13182673	11139253	15226093
APR 2007	13168435	11040392	15296477
MAY 2007	13621869	11412387	15831350

Table 3-18 Forecasts of Turkish Imports for the next 12 Months Period Based on ARIMA (2,1,0)(1,0,0)

3.8 Applications of Forecasting Techniques on Turkish Export and Import by Sectors

At this stage, forecasting models will be applied on main sectors that constitute Turkish export and import. The data were gathered from Turkish Statistical Institute and they include values beginning from January 1996 to May 2006. Statistical data are based on International Standard Industrial Classification of All Economic Activities ISIC prepared by United Nations and commonly accepted in the entire world.

The sectors that constitute Turkish export and import are

A. Agriculture and Forestry
B. Fishing
C. Mining and Quarrying
D. Manufacturing
E. Electricity, Gas and Water Supply
G. Wholesale and Retail Trade
K. Other Business Activities
O. Social and Personal Activities.

Expert Modeler of SPSS 14.0 that automatically identifies and estimates the best-fitting ARIMA or exponential smoothing model will be used to determine the best forecasting model and forecasts will be done accordingly.

3.8.1 Agriculture and Forestry

Table 3-19 Turkish Agriculture and Forestry Export Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	201807	2000-01	125660	2004-01	200752
1996-02	195285	2000-02	161581	2004-02	162470
1996-03	192557	2000-03	157078	2004-03	199211
1996-04	162638	2000-04	140504	2004-04	176535
1996-05	113829	2000-05	114360	2004-05	138259
1996-06	106625	2000-06	101299	2004-06	204754
1996-07	101097	2000-07	54223	2004-07	149969
1996-08	79403	2000-08	48622	2004-08	123862
1996-09	167677	2000-09	139394	2004-09	275626
1996-10	258218	2000-10	196746	2004-10	313486
1996-11	305774	2000-11	234029	2004-11	308524
1996-12	267668	2000-12	185596	2004-12	288329
1997-01	219654	2001-01	153398	2005-01	211697
1997-02	193367	2001-02	159114	2005-02	228890
1997-03	178520	2001-03	141070	2005-03	281806
1997-04	220384	2001-04	145927	2005-04	195818
1997-05	164010	2001-05	122525	2005-05	203515
1997-06	143563	2001-06	152427	2005-06	212529
1997-07	126292	2001-07	120490	2005-07	201629
1997-08	86633	2001-08	154827	2005-08	150291
1997-09	184229	2001-09	214018	2005-09	485344
1997-10	267900	2001-10	244838	2005-10	419150
1997-11	269644	2001-11	207836	2005-11	346930
1997-12	299653	2001-12	159940	2005-12	391204
1998-01	223975	2002-01	170565	2006-01	233613
1998-02	204013	2002-02	146805	2006-02	271469
1998-03	248754	2002-03	143177	2006-03	339329
1998-04	145461	2002-04	114473	2006-04	254715
1998-05	178657	2002-05	84061	2006-05	225037
1998-06	164490	2002-06	100272		
1998-07	115956	2002-07	90698		
1998-08	120581	2002-08	78274		
1998-09	224736	2002-09	175522		
1998-10	259862	2002-10	259089		
1998-11	231305	2002-11	216924		
1998-12	239636	2002-12	174426		
1999-01	196532	2003-01	214476		
1999-02	252718	2003-02	145613		
1999-03	233181	2003-03	175221		
1999-04	171955	2003-04	140237		
1999-05	111835	2003-05	108047		
1999-06	121449	2003-06	122319		
1999-07	94401	2003-07	125840		
1999-08	77059	2003-08	95577		
1999-09	168982	2003-09	167421		
1999-10	244703	2003-10	330669		
1999-11	221322	2003-11	246470		
1999-12	163376	2003-12	248798		

Table 3-20 Turkish Agriculture and Forestry Import Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	191026	2000-01	126612	2004-01	205485
1996-02	167012	2000-02	223783	2004-02	182210
1996-03	257262	2000-03	217202	2004-03	315761
1996-04	237909	2000-04	240684	2004-04	255062
1996-05	240519	2000-05	244996	2004-05	247615
1996-06	195129	2000-06	193792	2004-06	307200
1996-07	206406	2000-07	136100	2004-07	277537
1996-08	135831	2000-08	156525	2004-08	221640
1996-09	135828	2000-09	140659	2004-09	184922
1996-10	126049	2000-10	142234	2004-10	160445
1996-11	117714	2000-11	170941	2004-11	173074
1996-12	155003	2000-12	129660	2004-12	226441
1997-01	207293	2001-01	174788	2005-01	187295
1997-02	188627	2001-02	129803	2005-02	205303
1997-03	260952	2001-03	95118	2005-03	290987
1997-04	182183	2001-04	92530	2005-04	282013
1997-05	243054	2001-05	116694	2005-05	259924
1997-06	210121	2001-06	123810	2005-06	264602
1997-07	204527	2001-07	124908	2005-07	246358
1997-08	216840	2001-08	136901	2005-08	229809
1997-09	170053	2001-09	100961	2005-09	202898
1997-10	177364	2001-10	92845	2005-10	169967
1997-11	157092	2001-11	118514	2005-11	215366
1997-12	198628	2001-12	102441	2005-12	246845
1998-01	128948	2002-01	137046	2006-01	202885
1998-02	190543	2002-02	119245	2006-02	230048
1998-03	190749	2002-03	185236	2006-03	252364
1998-04	140620	2002-04	213422	2006-04	261086
1998-05	184058	2002-05	206315	2006-05	268341
1998-06	205356	2002-06	169594		
1998-07	239319	2002-07	151489		
1998-08	209873	2002-08	146014		
1998-09	154277	2002-09	83817		
1998-10	141843	2002-10	69272		
1998-11	143726	2002-11	96763		
1998-12	196073	2002-12	124430		
1999-01	136810	2003-01	108586		
1999-02	124826	2003-02	109187		
1999-03	134917	2003-03	212983		
1999-04	158440	2003-04	226498		
1999-05	158024	2003-05	287072		
1999-06	149099	2003-06	292696		
1999-07	155717	2003-07	282670		
1999-08	137877	2003-08	288799		
1999-09	128227	2003-09	166034		
1999-10	93827	2003-10	156475		
1999-11	118964	2003-11	153421		
1999-12	151791	2003-12	251006		

Model Description for Agriculture and Forestry Export Data
Model Type
Simple Seasonal

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,462	.	,462	,462	,462	,462	,462	,462	,462	,462	,462
R-squared	,789	.	,789	,789	,789	,789	,789	,789	,789	,789	,789
RMSE	34379,898	.	34379,898	34379,898	34379,898	34379,898	34379,898	34379,898	34379,898	34379,898	34379,898
MAPE	13,125	.	13,125	13,125	13,125	13,125	13,125	13,125	13,125	13,125	13,125
MaxAPE	45,698	.	45,698	45,698	45,698	45,698	45,698	45,698	45,698	45,698	45,698
MAE	23925,090	.	23925,090	23925,090	23925,090	23925,090	23925,090	23925,090	23925,090	23925,090	23925,090
MaxAE	206771,4	.	206771,4	206771,4	206771,4	206771,4	206771,4	206771,4	206771,4	206771,4	206771,4
Normalized BIC	20,968	.	20,968	20,968	20,968	20,968	20,968	20,968	20,968	20,968	20,968

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
AgrFor-Model_1	0	,462	,789	34379,898	13,125	23925,090	45,698	206771,4	34,055	16	,005	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
AgrFor-Model_1	Forecast	236771	211857	195310	314092	373263	352672	335659	289444	286644	301969	263673	235990
	UCL	304824	282908	269238	390788	452632	434626	420119	376338	375905	393537	357490	332004
	LCL	168718	140806	121383	237395	293894	270718	251199	202551	197383	210401	169855	139975

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

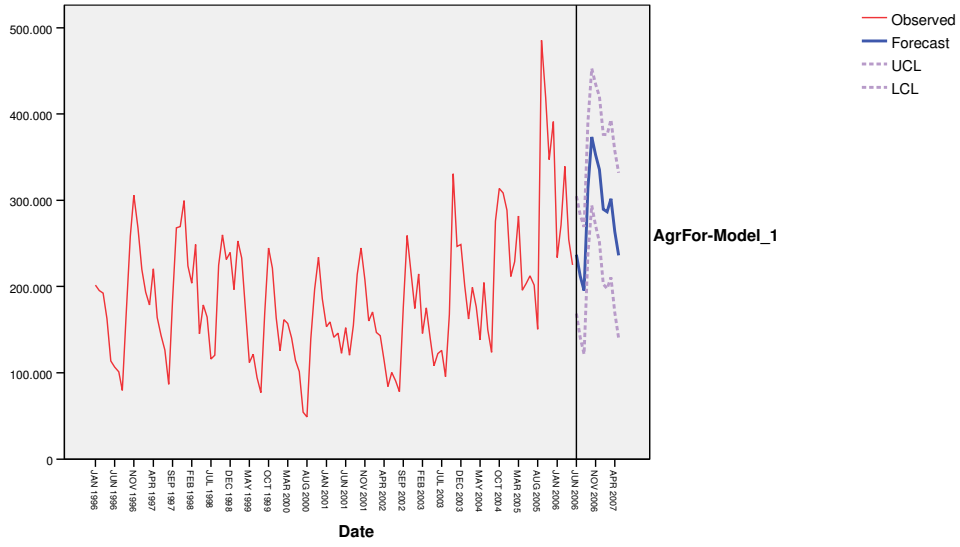

Figure 3-38 Model Description for Agriculture and Forestry Export Data

Model Description for Agriculture and Forestry Import Data
Model Type
Simple Seasonal

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,496	.	,496	,496	,496	,496	,496	,496	,496	,496	,496
R-squared	,689	.	,689	,689	,689	,689	,689	,689	,689	,689	,689
RMSE	31515,568	.	31515,568	31515,568	31515,568	31515,568	31515,568	31515,568	31515,568	31515,568	31515,568
MAPE	14,294	.	14,294	14,294	14,294	14,294	14,294	14,294	14,294	14,294	14,294
MaxAPE	103,980	.	103,980	103,980	103,980	103,980	103,980	103,980	103,980	103,980	103,980
MAE	24082,640	.	24082,640	24082,640	24082,640	24082,640	24082,640	24082,640	24082,640	24082,640	24082,640
MaxAE	98903,510	.	98903,510	98903,510	98903,510	98903,510	98903,510	98903,510	98903,510	98903,510	98903,510
Normalized BIC	20,794	.	20,794	20,794	20,794	20,794	20,794	20,794	20,794	20,794	20,794

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
AgrForM-Model_1	0	,496	,689	31515,568	14,294	24082,640	103,980	98903,510	21,265	16	,169	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
AgrForM-Model_1	Forecast	257557	248920	234428	193184	179449	192974	224649	210669	216470	265828	254639	269744
	UCL	319940	321672	316244	283157	276898	297365	335548	327715	339356	394289	388442	408684
	LCL	195174	176168	152611	103211	82000	88583	113749	93622	93584	137368	120836	130804

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

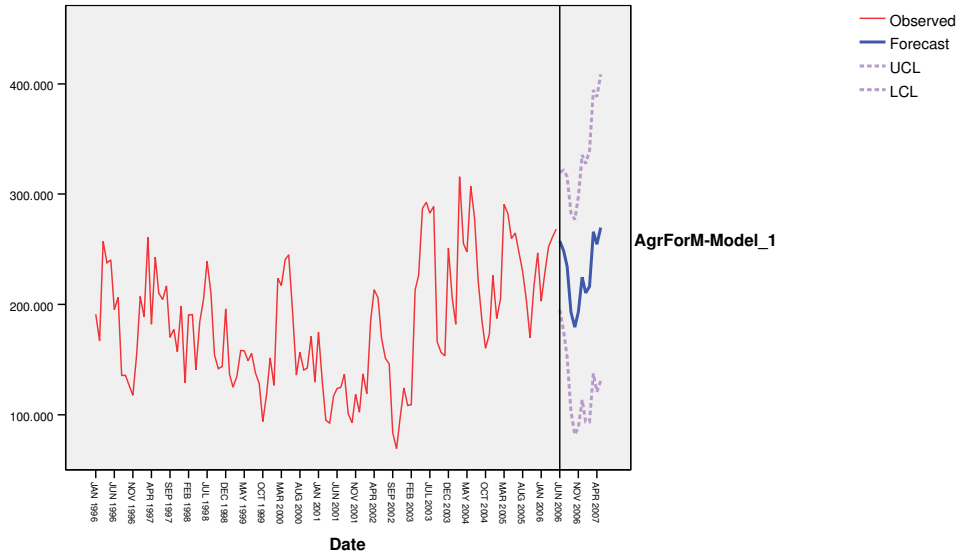

Figure 3-39 Model Description for Agriculture and Forestry Import Data

3.8.2 Fishing

Table 3-21 Turkish Fishing Export Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	1933	2000-01	2996	2004-01	7577
1996-02	1765	2000-02	2878	2004-02	4868
1996-03	1473	2000-03	2717	2004-03	7134
1996-04	1242	2000-04	2051	2004-04	5181
1996-05	1798	2000-05	1430	2004-05	5932
1996-06	1543	2000-06	1225	2004-06	4366
1996-07	2475	2000-07	1633	2004-07	4958
1996-08	2711	2000-08	1881	2004-08	5635
1996-09	2792	2000-09	1544	2004-09	10190
1996-10	2682	2000-10	1553	2004-10	12617
1996-11	2499	2000-11	1631	2004-11	20990
1996-12	3595	2000-12	2967	2004-12	13671
1997-01	2131	2001-01	2287	2005-01	8465
1997-02	1581	2001-02	3214	2005-02	16934
1997-03	2948	2001-03	1743	2005-03	10826
1997-04	2347	2001-04	1533	2005-04	4092
1997-05	2832	2001-05	1162	2005-05	6001
1997-06	2987	2001-06	1908	2005-06	7560
1997-07	3528	2001-07	2345	2005-07	6443
1997-08	3108	2001-08	1795	2005-08	8593
1997-09	2619	2001-09	2767	2005-09	27889
1997-10	3176	2001-10	2658	2005-10	19639
1997-11	2958	2001-11	4512	2005-11	10092
1997-12	2956	2001-12	3821	2005-12	12966
1998-01	3053	2002-01	2680	2006-01	7603
1998-02	2697	2002-02	2514	2006-02	15041
1998-03	2598	2002-03	3931	2006-03	6188
1998-04	1720	2002-04	3182	2006-04	6486
1998-05	1930	2002-05	3058	2006-05	3523
1998-06	1129	2002-06	3114		
1998-07	475	2002-07	3617		
1998-08	306	2002-08	3601		
1998-09	335	2002-09	4699		
1998-10	814	2002-10	4938		
1998-11	948	2002-11	7405		
1998-12	1177	2002-12	8681		
1999-01	3683	2003-01	7862		
1999-02	3756	2003-02	3858		
1999-03	4123	2003-03	5784		
1999-04	3894	2003-04	4579		
1999-05	3766	2003-05	3787		
1999-06	2484	2003-06	2115		
1999-07	2776	2003-07	3909		
1999-08	2977	2003-08	4480		
1999-09	2849	2003-09	6073		
1999-10	2563	2003-10	7708		
1999-11	2060	2003-11	6042		
1999-12	2967	2003-12	24550		

Table 3-22 Turkish Fishing Import Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	137	2000-01	249	2004-01	199
1996-02	45	2000-02	37	2004-02	278
1996-03	187	2000-03	62	2004-03	361
1996-04	99	2000-04	240	2004-04	485
1996-05	91	2000-05	423	2004-05	451
1996-06	157	2000-06	187	2004-06	645
1996-07	192	2000-07	59	2004-07	513
1996-08	86	2000-08	92	2004-08	354
1996-09	68	2000-09	60	2004-09	673
1996-10	179	2000-10	114	2004-10	306
1996-11	70	2000-11	37	2004-11	2636
1996-12	238	2000-12	100	2004-12	966
1997-01	93	2001-01	73	2005-01	522
1997-02	82	2001-02	230	2005-02	1758
1997-03	108	2001-03	94	2005-03	2059
1997-04	141	2001-04	156	2005-04	1854
1997-05	204	2001-05	127	2005-05	1421
1997-06	133	2001-06	61	2005-06	1387
1997-07	118	2001-07	24	2005-07	1233
1997-08	95	2001-08	17	2005-08	1155
1997-09	188	2001-09	13	2005-09	6288
1997-10	124	2001-10	26	2005-10	1754
1997-11	138	2001-11	35	2005-11	552
1997-12	277	2001-12	21	2005-12	4250
1998-01	30	2002-01	24	2006-01	1094
1998-02	86	2002-02	32	2006-02	1469
1998-03	209	2002-03	79	2006-03	2088
1998-04	219	2002-04	130	2006-04	2189
1998-05	124	2002-05	76	2006-05	1814
1998-06	158	2002-06	106		
1998-07	114	2002-07	133		
1998-08	58	2002-08	150		
1998-09	21	2002-09	96		
1998-10	7	2002-10	89		
1998-11	69	2002-11	168		
1998-12	35	2002-12	116		
1999-01	47	2003-01	161		
1999-02	85	2003-02	102		
1999-03	315	2003-03	553		
1999-04	80	2003-04	132		
1999-05	173	2003-05	194		
1999-06	121	2003-06	141		
1999-07	99	2003-07	217		
1999-08	78	2003-08	217		
1999-09	17	2003-09	199		
1999-10	86	2003-10	149		
1999-11	51	2003-11	137		
1999-12	39	2003-12	226		

Model Description for Fishing Export Data
Model Type
Simple Seasonal

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile 5	10	25	50	75	90	95
Stationary R-squared	,550	.	,550	,550	,550	,550	,550	,550	,550	,550	,550
R-squared	,533	.	,533	,533	,533	,533	,533	,533	,533	,533	,533
RMSE	3136,696	.	3136,696	3136,696	3136,696	3136,696	3136,696	3136,696	3136,696	3136,696	3136,696
MAPE	59,947	.	59,947	59,947	59,947	59,947	59,947	59,947	59,947	59,947	59,947
MaxAPE	1052,930	.	1052,930	1052,930	1052,930	1052,930	1052,930	1052,930	1052,930	1052,930	1052,930
MAE	1909,281	.	1909,281	1909,281	1909,281	1909,281	1909,281	1909,281	1909,281	1909,281	1909,281
MaxAE	17068,052	.	17068,052	17068,052	17068,052	17068,052	17068,052	17068,052	17068,052	17068,052	17068,052
Normalized BIC	16,179	.	16,179	16,179	16,179	16,179	16,179	16,179	16,179	16,179	16,179

Model Statistics

Model	Number of Predictors	Model Fit statistics: Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Ljung-Box Q(18): Statistics	DF	Sig.	Number of Outliers
FishingX-Model_1	0	,550	,533	3136,696	59,947	1909,281	1052,930	17068,052	64,038	16	,000	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
FishingX-Model_1	Forecast	7365	7738	8030	10697	10357	10435	12257	9092	9895	9019	7822	7723
	UCL	13574	14070	14483	17268	17044	17237	19171	16116	17029	16259	15169	15174
	LCL	1156	1406	1578	4127	3669	3634	5343	2067	2762	1778	476	273

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

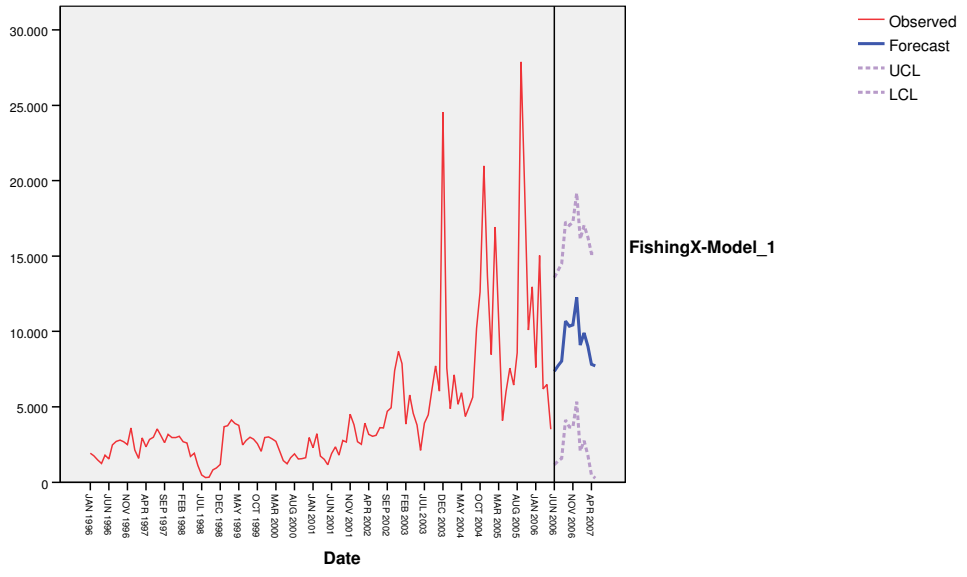

Figure 3-40 Model Description for Fishing Export Data

Model Description for Fishing Import Data
Model Type
Winters' Multiplicative

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,835	.	,835	,835	,835	,835	,835	,835	,835	,835	,835
R-squared	,791	.	,791	,791	,791	,791	,791	,791	,791	,791	,791
RMSE	380,378	.	380,378	380,378	380,378	380,378	380,378	380,378	380,378	380,378	380,378
MAPE	211,493	.	211,493	211,493	211,493	211,493	211,493	211,493	211,493	211,493	211,493
MaxAPE	3454,477	.	3454,477	3454,477	3454,477	3454,477	3454,477	3454,477	3454,477	3454,477	3454,477
MAE	207,743	.	207,743	207,743	207,743	207,743	207,743	207,743	207,743	207,743	207,743
MaxAE	2107,635	.	2107,635	2107,635	2107,635	2107,635	2107,635	2107,635	2107,635	2107,635	2107,635
Normalized BIC	11,998	.	11,998	11,998	11,998	11,998	11,998	11,998	11,998	11,998	11,998

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
FishingM-Model_1	0	,835	,791	380,378	211,493	207,743	3454,477	2107,635	39,446	15	,001	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
FishingM-Model_1	Forecast	1144	1270	1423	6062	1565	2162	4370	769	1893	2325	2460	1863
	UCL	1897	2044	2222	7588	2393	3079	5707	1547	2870	3415	3595	2861
	LCL	391	497	624	4535	737	1244	3032	-9	916	1235	1325	866

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

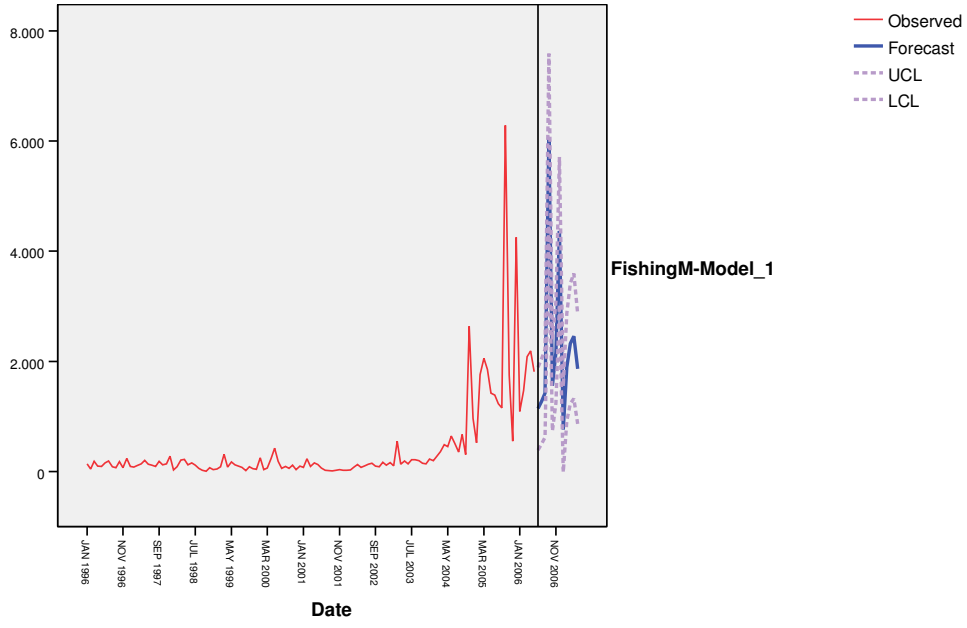

Figure 3-41 Model Description for Fishing Import Data

3.8.3 Mining and Quarrying

Table 3-23 Turkish Mining and Quarrying Export Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	24825	2000-01	28323	2004-01	40330
1996-02	32128	2000-02	19957	2004-02	43574
1996-03	33897	2000-03	31314	2004-03	49311
1996-04	28579	2000-04	37884	2004-04	47082
1996-05	26674	2000-05	36247	2004-05	61028
1996-06	32388	2000-06	43982	2004-06	45632
1996-07	38973	2000-07	38630	2004-07	65997
1996-08	25584	2000-08	33110	2004-08	49488
1996-09	40310	2000-09	35462	2004-09	55107
1996-10	33015	2000-10	27983	2004-10	64372
1996-11	18888	2000-11	31532	2004-11	60862
1996-12	33365	2000-12	35844	2004-12	66454
1997-01	24925	2001-01	25214	2005-01	54936
1997-02	27384	2001-02	20949	2005-02	46268
1997-03	32892	2001-03	28069	2005-03	64701
1997-04	23144	2001-04	24389	2005-04	61539
1997-05	50332	2001-05	29038	2005-05	79304
1997-06	19663	2001-06	37607	2005-06	71902
1997-07	44297	2001-07	40244	2005-07	66046
1997-08	37937	2001-08	22696	2005-08	73008
1997-09	33799	2001-09	26809	2005-09	71867
1997-10	32654	2001-10	32906	2005-10	72638
1997-11	34554	2001-11	38969	2005-11	60810
1997-12	42682	2001-12	21761	2005-12	87223
1998-01	32480	2002-01	30197	2006-01	55332
1998-02	25103	2002-02	17098	2006-02	64331
1998-03	32895	2002-03	30742	2006-03	67988
1998-04	32240	2002-04	32542	2006-04	95630
1998-05	34538	2002-05	32707	2006-05	111903
1998-06	36620	2002-06	35047		
1998-07	28980	2002-07	40889		
1998-08	37420	2002-08	34770		
1998-09	29116	2002-09	28778		
1998-10	26037	2002-10	40781		
1998-11	18121	2002-11	39899		
1998-12	30102	2002-12	23742		
1999-01	17238	2003-01	27122		
1999-02	23854	2003-02	21769		
1999-03	32370	2003-03	41157		
1999-04	40405	2003-04	29114		
1999-05	37319	2003-05	38799		
1999-06	31358	2003-06	38902		
1999-07	34766	2003-07	45610		
1999-08	29299	2003-08	46902		
1999-09	34889	2003-09	44107		
1999-10	31648	2003-10	48864		
1999-11	35301	2003-11	45449		
1999-12	36546	2003-12	41293		

Table 3-24 Turkish Mining and Quarrying Import Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	313107	2000-01	517212	2004-01	972603
1996-02	501535	2000-02	533595	2004-02	797247
1996-03	328787	2000-03	501785	2004-03	820228
1996-04	392651	2000-04	529877	2004-04	731759
1996-05	381018	2000-05	464666	2004-05	805200
1996-06	376808	2000-06	601500	2004-06	849964
1996-07	400130	2000-07	502237	2004-07	881067
1996-08	433997	2000-08	581788	2004-08	968815
1996-09	421373	2000-09	538937	2004-09	937449
1996-10	474159	2000-10	719211	2004-10	985821
1996-11	460507	2000-11	837860	2004-11	1077782
1996-12	597888	2000-12	768099	2004-12	1153002
1997-01	529374	2001-01	550709	2005-01	1091202
1997-02	423684	2001-02	606169	2005-02	993941
1997-03	465899	2001-03	600297	2005-03	1230612
1997-04	376779	2001-04	494900	2005-04	1207468
1997-05	408066	2001-05	579142	2005-05	1228730
1997-06	370273	2001-06	507359	2005-06	1189756
1997-07	366200	2001-07	529759	2005-07	1465079
1997-08	406649	2001-08	556980	2005-08	1474557
1997-09	453815	2001-09	598250	2005-09	1459537
1997-10	429239	2001-10	507151	2005-10	1717031
1997-11	474272	2001-11	541306	2005-11	1526324
1997-12	423724	2001-12	504805	2005-12	1736962
1998-01	362794	2002-01	731924	2006-01	1493008
1998-02	321792	2002-02	490570	2006-02	1517852
1998-03	380235	2002-03	561564	2006-03	1709771
1998-04	260168	2002-04	477892	2006-04	1927576
1998-05	336728	2002-05	560367	2006-05	1663660
1998-06	278057	2002-06	549163		
1998-07	277662	2002-07	597848		
1998-08	334882	2002-08	636983		
1998-09	311938	2002-09	629702		
1998-10	315327	2002-10	628599		
1998-11	256326	2002-11	610728		
1998-12	311563	2002-12	716965		
1999-01	303498	2003-01	807149		
1999-02	256626	2003-02	714192		
1999-03	272138	2003-03	813038		
1999-04	313932	2003-04	658833		
1999-05	287773	2003-05	655324		
1999-06	341360	2003-06	627778		
1999-07	413629	2003-07	704007		
1999-08	380197	2003-08	832698		
1999-09	356953	2003-09	779843		
1999-10	339804	2003-10	796806		
1999-11	413855	2003-11	782462		
1999-12	565973	2003-12	848378		

Model Description for Mining and Quarrying Export Data
Model Type
Winters's Additive

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,667	.	,667	,667	,667	,667	,667	,667	,667	,667	,667
R-squared	,822	.	,822	,822	,822	,822	,822	,822	,822	,822	,822
RMSE	7045,292	.	7045,292	7045,292	7045,292	7045,292	7045,292	7045,292	7045,292	7045,292	7045,292
MAPE	15,509	.	15,509	15,509	15,509	15,509	15,509	15,509	15,509	15,509	15,509
MaxAPE	64,561	.	64,561	64,561	64,561	64,561	64,561	64,561	64,561	64,561	64,561
MAE	5555,387	.	5555,387	5555,387	5555,387	5555,387	5555,387	5555,387	5555,387	5555,387	5555,387
MaxAE	23932,554	.	23932,554	23932,554	23932,554	23932,554	23932,554	23932,554	23932,554	23932,554	23932,554
Normalized BIC	17,836	.	17,836	17,836	17,836	17,836	17,836	17,836	17,836	17,836	17,836

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
Mining-Model_1	0	,667	,822	7045,292	15,509	5555,387	64,561	23932,554	10,169	15	,809	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
Mining-Model_1	Forecast	85306	91714	87567	89844	92182	90803	95537	89532	89120	99745	101668	110691
	UCL	99253	105851	101929	104467	107105	106064	111175	105587	105632	116753	119210	128806
	LCL	71359	77577	73205	75220	77260	75542	79899	73477	72608	82737	84125	92576

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

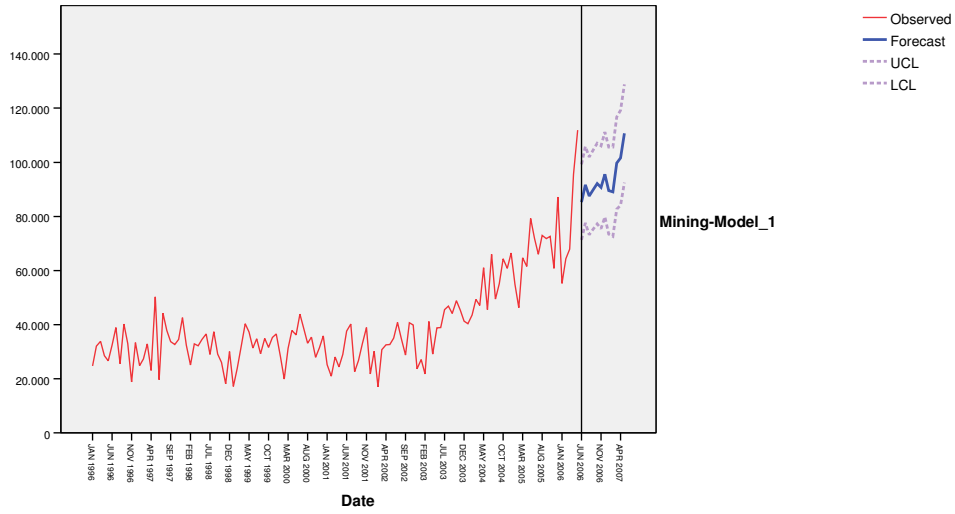

Figure 3-42 Model Description for Mining and Quarrying Export Data

Model Description for Mining and Quarrying Import Data
Model Type
Winters's Additive

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile 5	10	25	50	75	90	95
Stationary R-squared	,528	.	,528	,528	,528	,528	,528	,528	,528	,528	,528
R-squared	,952	.	,952	,952	,952	,952	,952	,952	,952	,952	,952
RMSE	82443,410	.	82443,410	82443,410	82443,410	82443,410	82443,410	82443,410	82443,410	82443,410	82443,410
MAPE	10,072	.	10,072	10,072	10,072	10,072	10,072	10,072	10,072	10,072	10,072
MaxAPE	41,452	.	41,452	41,452	41,452	41,452	41,452	41,452	41,452	41,452	41,452
MAE	60372,018	.	60372,018	60372,018	60372,018	60372,018	60372,018	60372,018	60372,018	60372,018	60372,018
MaxAE	288584,8	.	288584,8	288584,8	288584,8	288584,8	288584,8	288584,8	288584,8	288584,8	288584,8
Normalized BIC	22,756	.	22,756	22,756	22,756	22,756	22,756	22,756	22,756	22,756	22,756

Model Statistics

Model	Number of Predictors	Model Fit statistics: Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Ljung-Box Q(18): Statistics	DF	Sig.	Number of Outliers
MiningM-Model_1	0	,528	,952	82443,410	10,072	60372,018	41,452	288584,8	16,326	15	,361	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
MiningM-Model_1	Forecast	1763059	1832250	1900527	1909790	1975577	2003328	2092321	2085138	2061253	2136430	2130330	2150306
	UCL	1926264	2002958	2082645	2107454	2192863	2244060	2359988	2382884	2391908	2502551	2534243	2594148
	LCL	1599854	1661542	1718410	1712125	1758291	1762596	1824655	1787392	1730598	1770310	1726417	1706464

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

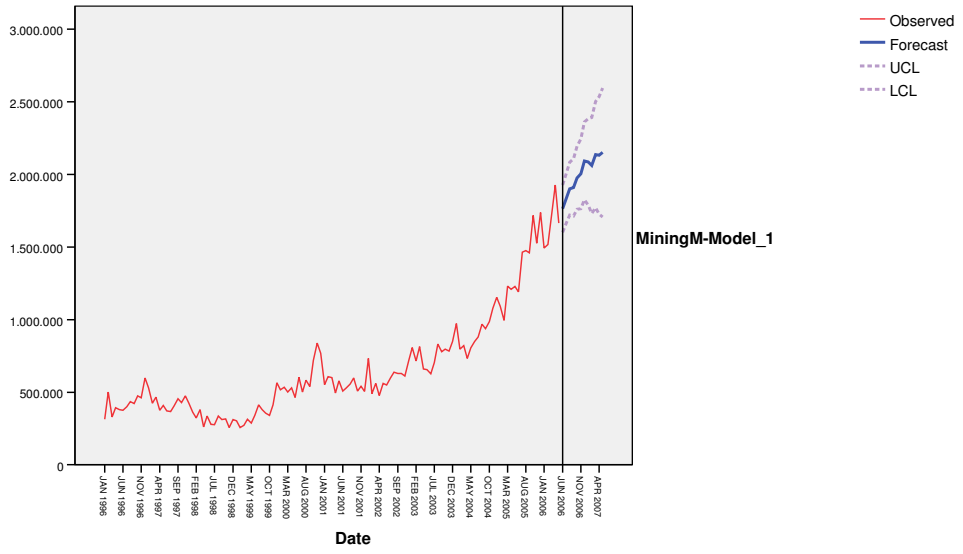

Figure 3-43 Model Description for Mining and Quarrying Import Data

3.8.4 Manufacturing

Table 3-25 Turkish Manufacturing Export Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	1511276	2000-01	1954754	2004-01	4347672
1996-02	1535622	2000-02	2066174	2004-02	3434601
1996-03	1769195	2000-03	2113201	2004-03	4939541
1996-04	1620186	2000-04	2244274	2004-04	4815549
1996-05	1467895	2000-05	2172629	2004-05	4939874
1996-06	1592898	2000-06	2164849	2004-06	5006072
1996-07	1759191	2000-07	2179912	2004-07	5383055
1996-08	1822672	2000-08	1947693	2004-08	4508514
1996-09	1672832	2000-09	2198706	2004-09	5291636
1996-10	1797626	2000-10	2006170	2004-10	5448930
1996-11	1891415	2000-11	2218922	2004-11	5319978
1996-12	2084953	2000-12	2250256	2004-12	6143696
1997-01	1785332	2001-01	2043833	2005-01	4699228
1997-02	1620604	2001-02	2318545	2005-02	5333455
1997-03	1946622	2001-03	2363619	2005-03	6195784
1997-04	1768397	2001-04	2429992	2005-04	5835599
1997-05	1959119	2001-05	2718348	2005-05	5653489
1997-06	1951517	2001-06	2354829	2005-06	5710140
1997-07	1964771	2001-07	2310734	2005-07	5466932
1997-08	2000154	2001-08	2387738	2005-08	5282188
1997-09	1992089	2001-09	2340917	2005-09	6189324
1997-10	2071937	2001-10	2518568	2005-10	6238594
1997-11	2199908	2001-11	2575610	2005-11	5495263
1997-12	2052350	2001-12	2463281	2005-12	6712897
1998-01	1919605	2002-01	2391570	2006-01	4775786
1998-02	1818856	2002-02	2206832	2006-02	5626903
1998-03	2176547	2002-03	2726337	2006-03	6923693
1998-04	1725242	2002-04	2579992	2006-04	5987348
1998-05	2186180	2002-05	2866270	2006-05	6447091
1998-06	2039929	2002-06	2618032		
1998-07	2051750	2002-07	2954889		
1998-08	2066931	2002-08	2847754		
1998-09	1941776	2002-09	2996304		
1998-10	2196457	2002-10	3181525		
1998-11	1987406	2002-11	3312475		
1998-12	1953908	2002-12	3019668		
1999-01	1648184	2003-01	3269448		
1999-02	1901845	2003-02	2741100		
1999-03	2118688	2003-03	3669792		
1999-04	1725532	2003-04	3472403		
1999-05	2057827	2003-05	3692102		
1999-06	1954542	2003-06	3615886		
1999-07	2113083	2003-07	4044595		
1999-08	1821034	2003-08	3662793		
1999-09	2054793	2003-09	3879084		
1999-10	2367527	2003-10	4411676		
1999-11	2178019	2003-11	3656510		
1999-12	2016737	2003-12	4263039		

Table 3-26 Turkish Manufacturing Import Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	2537654	2000-01	2519286	2004-01	4953303
1996-02	2110102	2000-02	3093608	2004-02	4967605
1996-03	3086943	2000-03	3382150	2004-03	6950890
1996-04	2946450	2000-04	3629300	2004-04	6586283
1996-05	3155491	2000-05	3817102	2004-05	6752348
1996-06	2747228	2000-06	4046071	2004-06	6994242
1996-07	3199126	2000-07	3947147	2004-07	7353943
1996-08	2852597	2000-08	4075675	2004-08	6403000
1996-09	2680374	2000-09	3881363	2004-09	6989120
1996-10	2930429	2000-10	4094606	2004-10	6717552
1996-11	3240298	2000-11	4264028	2004-11	6989655
1996-12	3720494	2000-12	3449907	2004-12	8789361
1997-01	2796295	2001-01	3226101	2005-01	5693472
1997-02	2404864	2001-02	2773670	2005-02	6747824
1997-03	3006145	2001-03	2352308	2005-03	8339235
1997-04	2850764	2001-04	2401535	2005-04	7772294
1997-05	3570940	2001-05	2811800	2005-05	8027770
1997-06	3184972	2001-06	2613971	2005-06	8310359
1997-07	3458167	2001-07	2722965	2005-07	7661321
1997-08	3436599	2001-08	2754992	2005-08	8250633
1997-09	3623102	2001-09	2691065	2005-09	8355286
1997-10	3662326	2001-10	2700814	2005-10	7913518
1997-11	3602551	2001-11	2853931	2005-11	7710302
1997-12	4205570	2001-12	2782950	2005-12	9425152
1998-01	2501181	2002-01	2522264	2006-01	6259306
1998-02	3282415	2002-02	2388095	2006-02	7788352
1998-03	3676091	2002-03	3145914	2006-03	9273403
1998-04	3186034	2002-04	3349009	2006-04	8993613
1998-05	3584972	2002-05	3489857	2006-05	9888873
1998-06	3600892	2002-06	3152165		
1998-07	3586864	2002-07	3750658		
1998-08	3082301	2002-08	3560409		
1998-09	3095623	2002-09	3678006		
1998-10	3096806	2002-10	3992097		
1998-11	3047127	2002-11	4065345		
1998-12	3284623	2002-12	4289210		
1999-01	1732982	2003-01	3374857		
1999-02	2354378	2003-02	3246108		
1999-03	2578837	2003-03	4354022		
1999-04	2781629	2003-04	4132404		
1999-05	2860430	2003-05	4429953		
1999-06	3017466	2003-06	4686119		
1999-07	2959375	2003-07	5164077		
1999-08	2595948	2003-08	4708558		
1999-09	3097133	2003-09	5065093		
1999-10	3055659	2003-10	5479995		
1999-11	3255448	2003-11	4134133		
1999-12	3646542	2003-12	6914446		

Model Description for Manufacturing Export Data
Model Type
Winters's Additive

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,475	.	,475	,475	,475	,475	,475	,475	,475	,475	,475
R-squared	,970	.	,970	,970	,970	,970	,970	,970	,970	,970	,970
RMSE	258814,6	.	258814,6	258814,6	258814,6	258814,6	258814,6	258814,6	258814,6	258814,6	258814,6
MAPE	5,903	.	5,903	5,903	5,903	5,903	5,903	5,903	5,903	5,903	5,903
MaxAPE	22,993	.	22,993	22,993	22,993	22,993	22,993	22,993	22,993	22,993	22,993
MAE	185337,1	.	185337,1	185337,1	185337,1	185337,1	185337,1	185337,1	185337,1	185337,1	185337,1
MaxAE	1080500	.	1080500	1080500	1080500	1080500	1080500	1080500	1080500	1080500	1080500
Normalized BIC	25,044	.	25,044	25,044	25,044	25,044	25,044	25,044	25,044	25,044	25,044

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
ManufacturingX-Model_1	0	,475	,970	258814,6	5,903	185337,1	22,993	1080500	32,620	15	,005	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
ManufacturingX-Model_1	Forecast	6306485	6289978	6059561	6881113	6919754	6316699	7410748	5697097	6500003	7655906	6839886	7178780
	UCL	6818835	6824436	6618612	7467168	7535133	6963626	8091344	6413380	7253891	8449221	7674361	8056063
	LCL	5794136	5755519	5500510	6295059	6304375	5669771	6730152	4980814	5746115	6862591	6005411	6301497

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

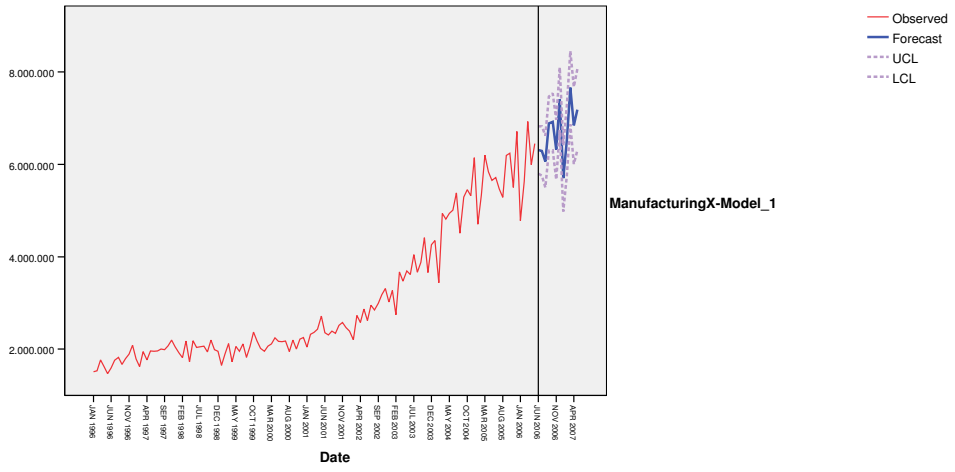

Figure 3-44 Model Description for Manufacturing Export Data

Model Description for Manufacturing Import Data
Model Type
Winters's Additive

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,322	.	,322	,322	,322	,322	,322	,322	,322	,322	,322
R-squared	,949	.	,949	,949	,949	,949	,949	,949	,949	,949	,949
RMSE	448925,3	.	448925,3	448925,3	448925,3	448925,3	448925,3	448925,3	448925,3	448925,3	448925,3
MAPE	7,528	.	7,528	7,528	7,528	7,528	7,528	7,528	7,528	7,528	7,528
MaxAPE	46,944	.	46,944	46,944	46,944	46,944	46,944	46,944	46,944	46,944	46,944
MAE	305854,0	.	305854,0	305854,0	305854,0	305854,0	305854,0	305854,0	305854,0	305854,0	305854,0
MaxAE	2147444	.	2147444	2147444	2147444	2147444	2147444	2147444	2147444	2147444	2147444
Normalized BIC	26,145	.	26,145	26,145	26,145	26,145	26,145	26,145	26,145	26,145	26,145

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
ManufacturingM-Model_1	0	,322	,949	448925,3	7,528	305854,0	46,944	2147444	41,801	15	,000	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
ManufacturingM-Model_1	Forecast	9503950	9265792	9417044	9522621	9280318	9215721	10917649	8026004	9312516	10611520	10034291	10396107
	UCL	10392643	10260632	10507751	10701425	10541079	10553428	12328112	9505650	10858254	12220637	11704385	12125029
	LCL	8615258	8270952	8326337	8343817	8019557	7878014	9507186	6546357	7766779	9002403	8364198	8667185

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

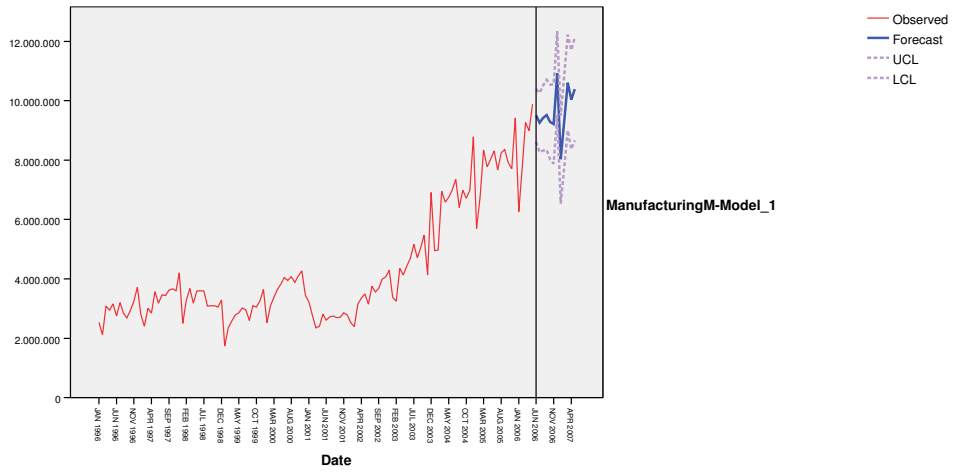

Figure 3-45 Model Description for Manufacturing Import Data

3.8.5 Electricity, Gas and Water Supply

Table 3-27 Turkish Electricity, Gas and Water Supply Export Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	2515	2000-01	1804	2004-01	5706
1996-02	2122	2000-02	1748	2004-02	5730
1996-03	2288	2000-03	1964	2004-03	4171
1996-04	2268	2000-04	1765	2004-04	5104
1996-05	403	2000-05	1737	2004-05	4919
1996-06	878	2000-06	1464	2004-06	4879
1996-07	690	2000-07	1493	2004-07	4688
1996-08	670	2000-08	1528	2004-08	4798
1996-09	649	2000-09	1113	2004-09	5243
1996-10	822	2000-10	1736	2004-10	4509
1996-11	978	2000-11	1934	2004-11	4825
1996-12	1204	2000-12	2101	2004-12	5601
1997-01	0	2001-01	2086	2005-01	7884
1997-02	2409	2001-02	1868	2005-02	7497
1997-03	0	2001-03	2060	2005-03	8845
1997-04	169	2001-04	1408	2005-04	8096
1997-05	1205	2001-05	1586	2005-05	8149
1997-06	1055	2001-06	1522	2005-06	8968
1997-07	1004	2001-07	1480	2005-07	997
1997-08	1031	2001-08	1514	2005-08	17042
1997-09	883	2001-09	1446	2005-09	8473
1997-10	1011	2001-10	1606	2005-10	765
1997-11	1031	2001-11	1869	2005-11	8897
1997-12	1302	2001-12	2044	2005-12	17836
1998-01	1400	2002-01	2044	2006-01	10739
1998-02	1233	2002-02	1167	2006-02	10241
1998-03	1448	2002-03	1352	2006-03	11229
1998-04	1301	2002-04	1357	2006-04	904
1998-05	1252	2002-05	1331	2006-05	19105
1998-06	1183	2002-06	1048		
1998-07	1169	2002-07	1158		
1998-08	1136	2002-08	1110		
1998-09	1082	2002-09	1139		
1998-10	982	2002-10	1226		
1998-11	1368	2002-11	1428		
1998-12	1359	2002-12	1481		
1999-01	1510	2003-01	1405		
1999-02	1299	2003-02	1289		
1999-03	1372	2003-03	1456		
1999-04	1347	2003-04	1180		
1999-05	1040	2003-05	1102		
1999-06	949	2003-06	943		
1999-07	1014	2003-07	999		
1999-08	1004	2003-08	977		
1999-09	906	2003-09	941		
1999-10	1056	2003-10	7048		
1999-11	1354	2003-11	1354		
1999-12	1416	2003-12	1398		

Table 3-28 Turkish Electricity, Gas and Water Supply Import Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	0	2000-01	9879	2004-01	1458
1996-02	0	2000-02	9837	2004-02	1247
1996-03	0	2000-03	11280	2004-03	1282
1996-04	0	2000-04	10020	2004-04	1123
1996-05	1379	2000-05	8512	2004-05	923
1996-06	2810	2000-06	11206	2004-06	951
1996-07	3697	2000-07	11483	2004-07	1577
1996-08	785	2000-08	10711	2004-08	1553
1996-09	1019	2000-09	10089	2004-09	1579
1996-10	498	2000-10	11306	2004-10	1112
1996-11	374	2000-11	12236	2004-11	1340
1996-12	1258	2000-12	15096	2004-12	1538
1997-01	0	2001-01	15209	2005-01	1724
1997-02	7794	2001-02	13839	2005-02	1540
1997-03	5191	2001-03	8073	2005-03	1548
1997-04	7515	2001-04	13362	2005-04	1337
1997-05	6974	2001-05	15626	2005-05	1424
1997-06	6976	2001-06	13580	2005-06	1290
1997-07	9863	2001-07	15135	2005-07	1601
1997-08	1441	2001-08	16989	2005-08	1571
1997-09	14675	2001-09	11585	2005-09	1403
1997-10	8489	2001-10	16321	2005-10	1468
1997-11	6656	2001-11	14932	2005-11	1614
1997-12	8396	2001-12	7628	2005-12	1688
1998-01	8439	2002-01	10422	2006-01	1723
1998-02	7159	2002-02	13153	2006-02	1474
1998-03	7675	2002-03	12854	2006-03	1725
1998-04	7368	2002-04	12175	2006-04	1726
1998-05	8203	2002-05	10363	2006-05	1725
1998-06	8989	2002-06	8949		
1998-07	9112	2002-07	9423		
1998-08	10039	2002-08	10521		
1998-09	9502	2002-09	10190		
1998-10	13140	2002-10	10370		
1998-11	12978	2002-11	9783		
1998-12	11776	2002-12	10010		
1999-01	5853	2003-01	11347		
1999-02	5373	2003-02	8420		
1999-03	5794	2003-03	15122		
1999-04	5453	2003-04	7694		
1999-05	7519	2003-05	0		
1999-06	7681	2003-06	0		
1999-07	7254	2003-07	0		
1999-08	6395	2003-08	0		
1999-09	6622	2003-09	0		
1999-10	6178	2003-10	0		
1999-11	6471	2003-11	0		
1999-12	10684	2003-12	869		

Model Description for Electricity, Gas and Water Supply Export Data
Model Type
Winters's Additive

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile 5	10	25	50	75	90	95
Stationary R-squared	,608	.	,608	,608	,608	,608	,608	,608	,608	,608	,608
R-squared	,637	.	,637	,637	,637	,637	,637	,637	,637	,637	,637
RMSE	2078,870	.	2078,870	2078,870	2078,870	2078,870	2078,870	2078,870	2078,870	2078,870	2078,870
MAPE	69,214	.	69,214	69,214	69,214	69,214	69,214	69,214	69,214	69,214	69,214
MaxAPE	1023,177	.	1023,177	1023,177	1023,177	1023,177	1023,177	1023,177	1023,177	1023,177	1023,177
MAE	1114,165	.	1114,165	1114,165	1114,165	1114,165	1114,165	1114,165	1114,165	1114,165	1114,165
MaxAE	9249,523	.	9249,523	9249,523	9249,523	9249,523	9249,523	9249,523	9249,523	9249,523	9249,523
Normalized BIC	15,395	.	15,395	15,395	15,395	15,395	15,395	15,395	15,395	15,395	15,395

Model Statistics

Model	Number of Predictors	Model Fit statistics: Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Ljung-Box Q(18): Statistics	DF	Sig.	Number of Outliers
ElectX-Model_1	0	,608	,637	2078,870	69,214	1114,165	1023,177	9249,523	37,801	15	,001	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
ElectX-Model_1	Forecast	10665	10107	11981	11349	11499	12188	13519	13919	14136	14359	13595	15396
	UCL	14780	14239	16147	15575	15816	16631	18127	18734	19199	19713	19279	21449
	LCL	6549	5976	7815	7123	7182	7744	8910	9104	9072	9006	7911	9343

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

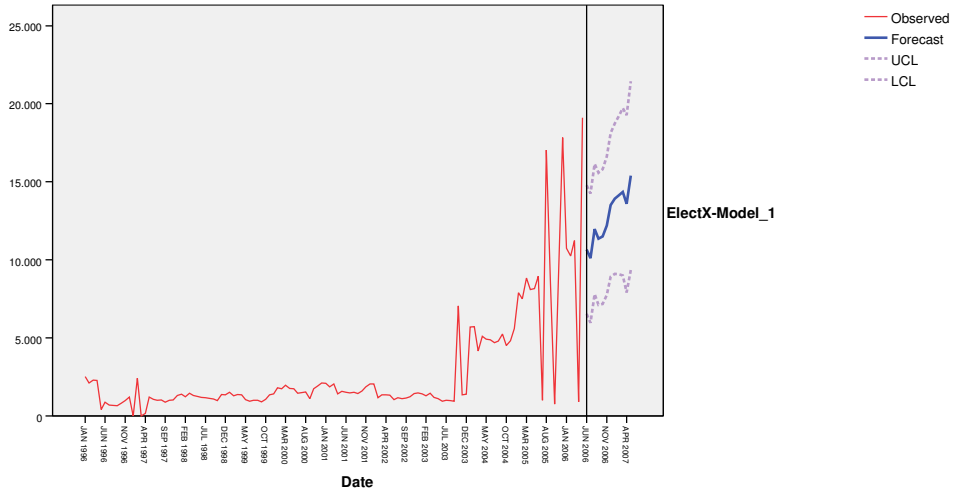

Figure 3-46 Model Description for Electricity, Gas and Water Supply Export Data

Model Description for Electricity, Gas and Water Supply Import Data
Model Type
Simple

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,171	.	,171	,171	,171	,171	,171	,171	,171	,171	,171
R-squared	,765	.	,765	,765	,765	,765	,765	,765	,765	,765	,765
RMSE	2413,683	.	2413,683	2413,683	2413,683	2413,683	2413,683	2413,683	2413,683	2413,683	2413,683
MAPE	29,231	.	29,231	29,231	29,231	29,231	29,231	29,231	29,231	29,231	29,231
MaxAPE	485,055	.	485,055	485,055	485,055	485,055	485,055	485,055	485,055	485,055	485,055
MAE	1414,388	.	1414,388	1414,388	1414,388	1414,388	1414,388	1414,388	1414,388	1414,388	1414,388
MaxAE	9951,881	.	9951,881	9951,881	9951,881	9951,881	9951,881	9951,881	9951,881	9951,881	9951,881
Normalized BIC	15,616	.	15,616	15,616	15,616	15,616	15,616	15,616	15,616	15,616	15,616

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
ElectM-Model_1	0	,171	,765	2413,683	29,231	1414,388	485,055	9951,881	10,011	17	,903	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
ElectM-Model_1	Forecast	1709	1709	1709	1709	1709	1709	1709	1709	1709	1709	1709	1709
	UCL	6486	7117	7681	8197	8674	9121	9542	9941	10323	10688	11038	11376
	LCL	-3068	-3699	-4263	-4778	-5256	-5702	-6124	-6523	-6905	-7270	-7620	-7958

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

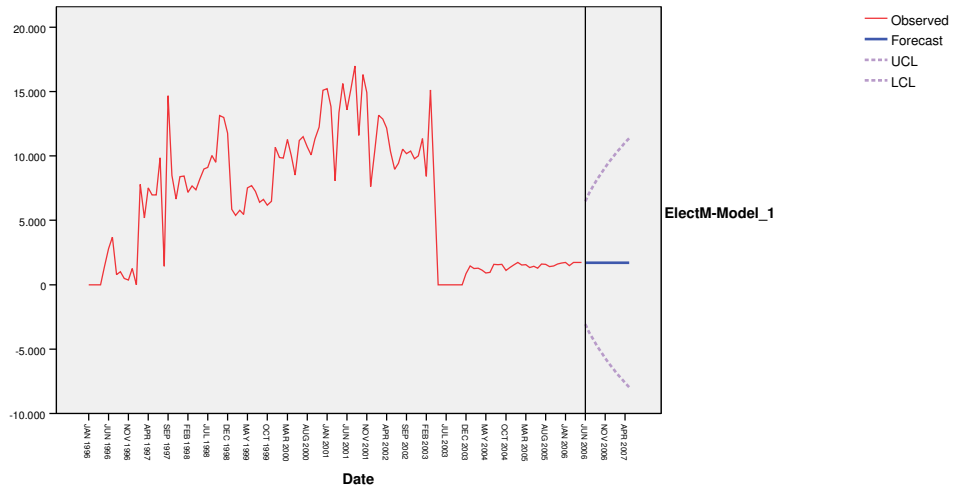

Figure 3-47 Model Description for Electricity, Gas and Water Supply Import Data

3.8.6 Wholesale and Retail Trade

Table 3-29 Turkish Wholesale and Retail Trade Export Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	10038	2000-01	9280	2004-01	17591
1996-02	12894	2000-02	11058	2004-02	13232
1996-03	9686	2000-03	9916	2004-03	18475
1996-04	12544	2000-04	12055	2004-04	22937
1996-05	12794	2000-05	11664	2004-05	20004
1996-06	12204	2000-06	12836	2004-06	18443
1996-07	11922	2000-07	12425	2004-07	22218
1996-08	11046	2000-08	11221	2004-08	15134
1996-09	12667	2000-09	13699	2004-09	18413
1996-10	9872	2000-10	10089	2004-10	23279
1996-11	9990	2000-11	10600	2004-11	18371
1996-12	8858	2000-12	11565	2004-12	22662
1997-01	12338	2001-01	9564	2005-01	14950
1997-02	11724	2001-02	12053	2005-02	18672
1997-03	15220	2001-03	9536	2005-03	29835
1997-04	11852	2001-04	12772	2005-04	22909
1997-05	13734	2001-05	11740	2005-05	26711
1997-06	12800	2001-06	12213	2005-06	27132
1997-07	10129	2001-07	8382	2005-07	21320
1997-08	9423	2001-08	10599	2005-08	21667
1997-09	9855	2001-09	9755	2005-09	31351
1997-10	13101	2001-10	10427	2005-10	21236
1997-11	14945	2001-11	12460	2005-11	20357
1997-12	9365	2001-12	7994	2005-12	23670
1998-01	13279	2002-01	10165	2006-01	14181
1998-02	11926	2002-02	9291	2006-02	24419
1998-03	15175	2002-03	13382	2006-03	31587
1998-04	10870	2002-04	11236	2006-04	28610
1998-05	15128	2002-05	12095	2006-05	31014
1998-06	14530	2002-06	13148		
1998-07	10985	2002-07	12519		
1998-08	10940	2002-08	10361		
1998-09	10918	2002-09	11749		
1998-10	11158	2002-10	13390		
1998-11	13427	2002-11	15449		
1998-12	12824	2002-12	14460		
1999-01	16132	2003-01	13372		
1999-02	10958	2003-02	9643		
1999-03	12481	2003-03	14834		
1999-04	9811	2003-04	14596		
1999-05	13761	2003-05	16624		
1999-06	11490	2003-06	15841		
1999-07	8904	2003-07	14985		
1999-08	8445	2003-08	17796		
1999-09	11124	2003-09	16960		
1999-10	11026	2003-10	18381		
1999-11	9299	2003-11	13826		
1999-12	10284	2003-12	15879		

Table 3-30 Turkish Wholesale and Retail Trade Import Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	112400	2000-01	55303	2004-01	195889
1996-02	81712	2000-02	69993	2004-02	190255
1996-03	69310	2000-03	50436	2004-03	362626
1996-04	86251	2000-04	80630	2004-04	355844
1996-05	120957	2000-05	77659	2004-05	183313
1996-06	99496	2000-06	107142	2004-06	314018
1996-07	102867	2000-07	64325	2004-07	213339
1996-08	97877	2000-08	53649	2004-08	287192
1996-09	80535	2000-09	67081	2004-09	371980
1996-10	72768	2000-10	56273	2004-10	221728
1996-11	118849	2000-11	76104	2004-11	322595
1996-12	101065	2000-12	71095	2004-12	301015
1997-01	80092	2001-01	104297	2005-01	244603
1997-02	74727	2001-02	67923	2005-02	371942
1997-03	92778	2001-03	51743	2005-03	330624
1997-04	85610	2001-04	32645	2005-04	329468
1997-05	89125	2001-05	35070	2005-05	291407
1997-06	99904	2001-06	39650	2005-06	178233
1997-07	94404	2001-07	35413	2005-07	219743
1997-08	96624	2001-08	34538	2005-08	309218
1997-09	95453	2001-09	22626	2005-09	338389
1997-10	94770	2001-10	47016	2005-10	284545
1997-11	110765	2001-11	29292	2005-11	216545
1997-12	103964	2001-12	42524	2005-12	264724
1998-01	103739	2002-01	29891	2006-01	180581
1998-02	72531	2002-02	26888	2006-02	256275
1998-03	108182	2002-03	32434	2006-03	342405
1998-04	38645	2002-04	159124	2006-04	374859
1998-05	60221	2002-05	36477	2006-05	380131
1998-06	73582	2002-06	56001		
1998-07	78992	2002-07	89214		
1998-08	91960	2002-08	64261		
1998-09	87901	2002-09	107288		
1998-10	70044	2002-10	129274		
1998-11	51096	2002-11	179085		
1998-12	65659	2002-12	228715		
1999-01	47054	2003-01	122881		
1999-02	46412	2003-02	107545		
1999-03	51357	2003-03	358902		
1999-04	74113	2003-04	185003		
1999-05	95088	2003-05	158595		
1999-06	67621	2003-06	120108		
1999-07	81530	2003-07	115854		
1999-08	57573	2003-08	143778		
1999-09	54299	2003-09	193797		
1999-10	62985	2003-10	140765		
1999-11	52788	2003-11	174454		
1999-12	58683	2003-12	218254		

Model Description for Wholesale and Retail Trade Export Data
Model Type
Winters's Additive

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,624	.	,624	,624	,624	,624	,624	,624	,624	,624	,624
R-squared	,787	.	,787	,787	,787	,787	,787	,787	,787	,787	,787
RMSE	2453,981	.	2453,981	2453,981	2453,981	2453,981	2453,981	2453,981	2453,981	2453,981	2453,981
MAPE	13,689	.	13,689	13,689	13,689	13,689	13,689	13,689	13,689	13,689	13,689
MaxAPE	74,985	.	74,985	74,985	74,985	74,985	74,985	74,985	74,985	74,985	74,985
MAE	1892,827	.	1892,827	1892,827	1892,827	1892,827	1892,827	1892,827	1892,827	1892,827	1892,827
MaxAE	10633,673	.	10633,673	10633,673	10633,673	10633,673	10633,673	10633,673	10633,673	10633,673	10633,673
Normalized BIC	15,727	.	15,727	15,727	15,727	15,727	15,727	15,727	15,727	15,727	15,727

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
WholeX-Model_1	0	,624	,787	2453,981	13,689	1892,827	74,985	10633,673	32,253	15	,006	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
WholeX-Model_1	Forecast	27952	26420	25857	27996	27695	27524	27560	27360	27965	31232	30481	32005
	UCL	32810	31287	30739	32898	32626	32493	32576	32433	33106	36454	35796	37425
	LCL	23094	21553	20975	23093	22764	22556	22545	22287	22824	26010	25167	26584

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
WholeX-Model_1	Forecast	27952	26420	25857	27996	27695	27524	27560	27360	27965	31232	30481	32005
	UCL	32810	31287	30739	32898	32626	32493	32576	32433	33106	36454	35796	37425
	LCL	23094	21553	20975	23093	22764	22556	22545	22287	22824	26010	25167	26584

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

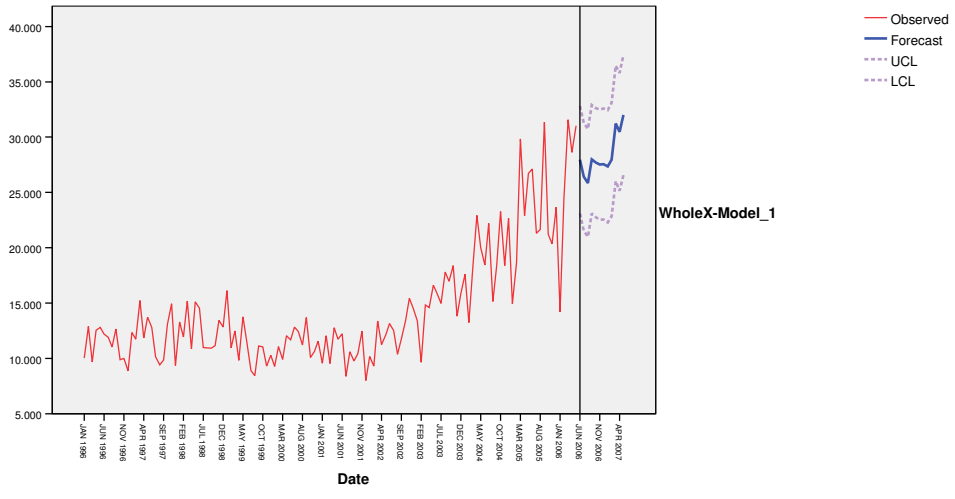

Figure 3-48 Model Description for Wholesale and Retail Trade Export Data

Model Description for Wholesale and Retail Trade Import Data
Model Type
Simple Seasonal

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,617	.	,617	,617	,617	,617	,617	,617	,617	,617	,617
R-squared	,789	.	,789	,789	,789	,789	,789	,789	,789	,789	,789
RMSE	45719,905	.	45719,905	45719,905	45719,905	45719,905	45719,905	45719,905	45719,905	45719,905	45719,905
MAPE	32,628	.	32,628	32,628	32,628	32,628	32,628	32,628	32,628	32,628	32,628
MaxAPE	206,628	.	206,628	206,628	206,628	206,628	206,628	206,628	206,628	206,628	206,628
MAE	33848,955	.	33848,955	33848,955	33848,955	33848,955	33848,955	33848,955	33848,955	33848,955	33848,955
MaxAE	182788,5	.	182788,5	182788,5	182788,5	182788,5	182788,5	182788,5	182788,5	182788,5	182788,5
Normalized BIC	21,538	.	21,538	21,538	21,538	21,538	21,538	21,538	21,538	21,538	21,538

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
WholeM-Model_1	0	,617	,789	45719,905	32,628	33848,955	206,628	182788,5	39,457	16	,001	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
WholeM-Model_1	Forecast	312321	306314	320412	338680	314762	329903	342315	312812	320946	365000	360581	335658
	UCL	402821	403752	424327	448690	430547	451188	468862	444410	457408	506159	506286	485772
	LCL	221821	208875	216498	228671	198977	208617	215768	181214	184483	223840	214876	185545

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

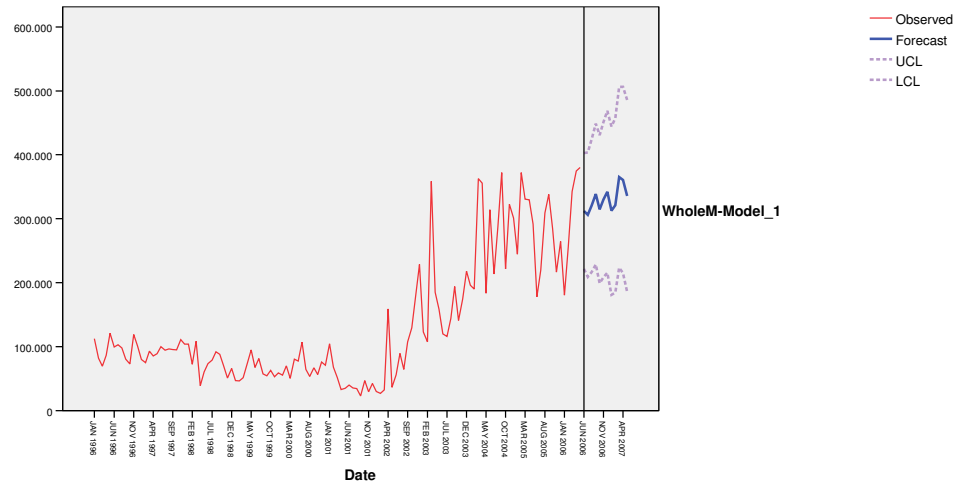

Figure 3-49 Model Description for Wholesale and Retail Trade Import Data

3.8.7 Other Business Activities

Table 3-31 Turkish 'Other Business Activities' Export Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	0,00	2000-01	10,80	2004-01	0,00
1996-02	0,16	2000-02	0,10	2004-02	0,26
1996-03	5,87	2000-03	10,00	2004-03	173,25
1996-04	0,08	2000-04	24,11	2004-04	5,33
1996-05	0,00	2000-05	48,01	2004-05	1,41
1996-06	2,95	2000-06	0,24	2004-06	218,31
1996-07	0,00	2000-07	0,00	2004-07	2,52
1996-08	0,30	2000-08	0,00	2004-08	0,84
1996-09	0,01	2000-09	11,43	2004-09	25,76
1996-10	13,92	2000-10	9,08	2004-10	133,94
1996-11	0,13	2000-11	0,45	2004-11	344,76
1996-12	0,00	2000-12	288,58	2004-12	447,92
1997-01	1,11	2001-01	1,91	2005-01	72,80
1997-02	0,00	2001-02	18,90	2005-02	5,14
1997-03	67,77	2001-03	3,59	2005-03	12,81
1997-04	0,20	2001-04	9,70	2005-04	0,45
1997-05	10,39	2001-05	0,36	2005-05	6,71
1997-06	0,24	2001-06	11,38	2005-06	55,28
1997-07	2,63	2001-07	13,68	2005-07	1,84
1997-08	0,16	2001-08	14,04	2005-08	55,13
1997-09	0,13	2001-09	4,89	2005-09	8,31
1997-10	0,18	2001-10	1197,45	2005-10	5,10
1997-11	0,00	2001-11	0,35	2005-11	22,64
1997-12	892,32	2001-12	0,00	2005-12	12,17
1998-01	15,08	2002-01	0,58	2006-01	43,55
1998-02	0,23	2002-02	0,16	2006-02	0,00
1998-03	0,22	2002-03	16,05	2006-03	6,33
1998-04	403,97	2002-04	14,85	2006-04	49,60
1998-05	2,11	2002-05	0,10	2006-05	9,92
1998-06	14,13	2002-06	12,75		
1998-07	0,18	2002-07	0,53		
1998-08	35,11	2002-08	0,54		
1998-09	0,18	2002-09	0,35		
1998-10	2,51	2002-10	4,19		
1998-11	4,47	2002-11	3,07		
1998-12	12,84	2002-12	1,97		
1999-01	8,95	2003-01	4,82		
1999-02	13,65	2003-02	57,09		
1999-03	6,81	2003-03	1,41		
1999-04	0,40	2003-04	0,40		
1999-05	0,66	2003-05	0,50		
1999-06	1,33	2003-06	1,57		
1999-07	16,74	2003-07	3,83		
1999-08	6,94	2003-08	1,36		
1999-09	5,50	2003-09	2,69		
1999-10	0,42	2003-10	1,50		
1999-11	88,71	2003-11	0,12		
1999-12	5,64	2003-12	6,13		

Table 3-32 Turkish 'Other Business Activities' Import Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	47,84	2000-01	23,61	2004-01	189,12
1996-02	25,20	2000-02	10,31	2004-02	261,66
1996-03	114,29	2000-03	41,29	2004-03	23,04
1996-04	68,09	2000-04	37,17	2004-04	24,78
1996-05	61,52	2000-05	13,15	2004-05	89,18
1996-06	107,99	2000-06	115,50	2004-06	39,01
1996-07	603,80	2000-07	31,72	2004-07	18,52
1996-08	34,99	2000-08	31,25	2004-08	75,42
1996-09	71,67	2000-09	1160,11	2004-09	12,03
1996-10	55,20	2000-10	25,64	2004-10	14,24
1996-11	377,72	2000-11	839,32	2004-11	30,94
1996-12	82,20	2000-12	3169,23	2004-12	89,16
1997-01	44,16	2001-01	19,91	2005-01	4,44
1997-02	96,79	2001-02	2569,51	2005-02	48,09
1997-03	79,97	2001-03	23,05	2005-03	100,95
1997-04	198,28	2001-04	2702,44	2005-04	63,06
1997-05	67,05	2001-05	36,58	2005-05	178,40
1997-06	63,99	2001-06	44,86	2005-06	56,81
1997-07	264,76	2001-07	784,46	2005-07	25,03
1997-08	89,44	2001-08	1173,72	2005-08	3695,26
1997-09	78,64	2001-09	285,64	2005-09	115,36
1997-10	21,20	2001-10	88,67	2005-10	458,69
1997-11	50,07	2001-11	609,95	2005-11	1191,35
1997-12	47,07	2001-12	21,15	2005-12	47,72
1998-01	10,24	2002-01	286,77	2006-01	28,53
1998-02	30,56	2002-02	14,84	2006-02	19,22
1998-03	37,81	2002-03	293,97	2006-03	93,09
1998-04	14,89	2002-04	282,29	2006-04	140,52
1998-05	105,44	2002-05	305,52	2006-05	127,21
1998-06	34,60	2002-06	327,01		
1998-07	26,76	2002-07	646,68		
1998-08	22,89	2002-08	26,71		
1998-09	68,83	2002-09	25,63		
1998-10	30,83	2002-10	17,17		
1998-11	66,17	2002-11	76,30		
1998-12	121,08	2002-12	33,69		
1999-01	14,34	2003-01	51,95		
1999-02	149,04	2003-02	74,38		
1999-03	24,02	2003-03	138,93		
1999-04	47,24	2003-04	280,31		
1999-05	11,37	2003-05	156,02		
1999-06	497,91	2003-06	6,55		
1999-07	45,77	2003-07	135,25		
1999-08	26,29	2003-08	91,98		
1999-09	21,76	2003-09	18,06		
1999-10	32,35	2003-10	20,83		
1999-11	11,68	2003-11	166,61		
1999-12	24,91	2003-12	57,38		

Model Description for 'Other Business Activities' Export Data
Model Type
ARIMA(0,0,0)

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	1,91E-016	.	1,91E-016	1,91E-016	1,91E-016	1,91E-016	1,91E-016	1,91E-016	1,91E-016	1,91E-016	1,91E-016
R-squared	1,91E-016	.	1,91E-016	1,91E-016	1,91E-016	1,91E-016	1,91E-016	1,91E-016	1,91E-016	1,91E-016	1,91E-016
RMSE	148,055	.	148,055	148,055	148,055	148,055	148,055	148,055	148,055	148,055	148,055
MAPE	9611,653	.	9611,653	9611,653	9611,653	9611,653	9611,653	9611,653	9611,653	9611,653	9611,653
MaxAPE	414541,6	.	414541,6	414541,6	414541,6	414541,6	414541,6	414541,6	414541,6	414541,6	414541,6
MAE	62,273	.	62,273	62,273	62,273	62,273	62,273	62,273	62,273	62,273	62,273
MaxAE	1155,986	.	1155,986	1155,986	1155,986	1155,986	1155,986	1155,986	1155,986	1155,986	1155,986
Normalized BIC	10,034	.	10,034	10,034	10,034	10,034	10,034	10,034	10,034	10,034	10,034

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
BusiX-Model_1	0	1,91E-016	1,91E-016	148,055	9611,653	62,273	414541,6	1155,986	5,381	18	,998	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
BusiX-Model_1	Forecast	41,46	41,46	41,46	41,46	41,46	41,46	41,46	41,46	41,46	41,46	41,46	41,46
	UCL	334,51	334,51	334,51	334,51	334,51	334,51	334,51	334,51	334,51	334,51	334,51	334,51
	LCL	-251,58	-251,58	-251,58	-251,58	-251,58	-251,58	-251,58	-251,58	-251,58	-251,58	-251,58	-251,58

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

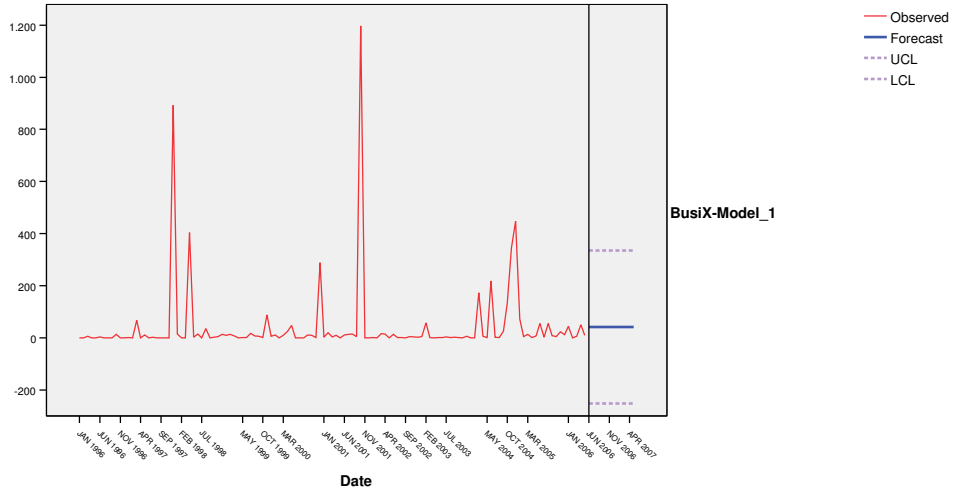

Figure 3-50 Model Description for 'Other Business Activities' Export Data

Model Description for 'Other Business Activities' Import Data
Model Type
Simple Seasonal

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,740	.	,740	,740	,740	,740	,740	,740	,740	,740	,740
R-squared	,092	.	,092	,092	,092	,092	,092	,092	,092	,092	,092
RMSE	539,489	.	539,489	539,489	539,489	539,489	539,489	539,489	539,489	539,489	539,489
MAPE	548,891	.	548,891	548,891	548,891	548,891	548,891	548,891	548,891	548,891	548,891
MaxAPE	3994,296	.	3994,296	3994,296	3994,296	3994,296	3994,296	3994,296	3994,296	3994,296	3994,296
MAE	282,753	.	282,753	282,753	282,753	282,753	282,753	282,753	282,753	282,753	282,753
MaxAE	3310,147	.	3310,147	3310,147	3310,147	3310,147	3310,147	3310,147	3310,147	3310,147	3310,147
Normalized BIC	12,658	.	12,658	12,658	12,658	12,658	12,658	12,658	12,658	12,658	12,658

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
BusiM-Model_1	0	,740	,092	539,489	548,891	282,753	3994,296	3310,147	25,388	16	,063	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
BusiM-Model_1	Forecast	176,14	304,99	573,51	232,49	123,19	388,72	416,07	112,25	346,68	134,93	397,54	151,39
	UCL	1244,02	1394,00	1683,25	1362,58	1273,28	1558,45	1605,12	1320,31	1573,46	1380,15	1660,92	1432,69
	LCL	-891,75	-784,03	-536,24	-897,61	-1026,89	-781,00	-772,98	-1095,81	-880,10	-1110,29	-865,85	-1129,91

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

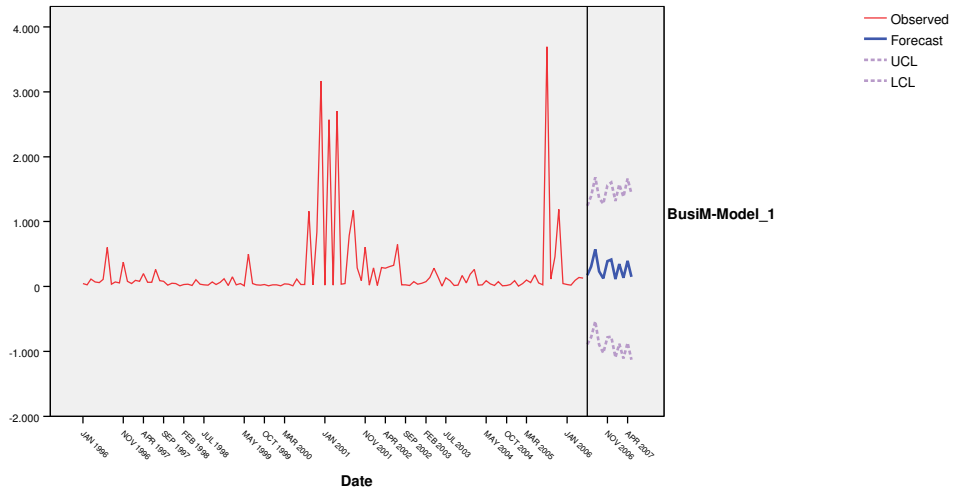

Figure 3-51 Model Description for 'Other Business Activities' Import Data

3.8.8 Social and Personal Activities

Table 3-33 Turkish 'Social and Personal Activities' Export Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	45,34	2000-01	271,17	2004-01	33,32
1996-02	40,80	2000-02	22,05	2004-02	28,74
1996-03	15,11	2000-03	718,34	2004-03	26,55
1996-04	56,20	2000-04	43,12	2004-04	69,59
1996-05	58,85	2000-05	71,42	2004-05	43,94
1996-06	35,64	2000-06	145,84	2004-06	20,37
1996-07	303,07	2000-07	11,62	2004-07	1251,02
1996-08	127,59	2000-08	28,60	2004-08	59,59
1996-09	42,50	2000-09	13368,29	2004-09	42,14
1996-10	101,19	2000-10	496,98	2004-10	15,52
1996-11	96,82	2000-11	715,52	2004-11	14,62
1996-12	45,94	2000-12	409,55	2004-12	13,13
1997-01	32,85	2001-01	18,05	2005-01	41,92
1997-02	21,97	2001-02	10,72	2005-02	20,58
1997-03	17,17	2001-03	2,84	2005-03	40,78
1997-04	36,45	2001-04	19,90	2005-04	78,74
1997-05	62,58	2001-05	281,09	2005-05	50,79
1997-06	30,44	2001-06	1124,35	2005-06	247,41
1997-07	6,11	2001-07	97,60	2005-07	98,48
1997-08	55,53	2001-08	284,24	2005-08	22,61
1997-09	36,04	2001-09	17,39	2005-09	12,98
1997-10	29,67	2001-10	344,54	2005-10	151,25
1997-11	69,06	2001-11	475,96	2005-11	29,84
1997-12	30,81	2001-12	1460,27	2005-12	130,15
1998-01	58,66	2002-01	98,49	2006-01	106,86
1998-02	23,34	2002-02	66,43	2006-02	28,40
1998-03	53,55	2002-03	6,53	2006-03	34,15
1998-04	44,84	2002-04	60,64	2006-04	20,94
1998-05	226,53	2002-05	801,73	2006-05	189,71
1998-06	3837,17	2002-06	19,97		
1998-07	52,34	2002-07	81,29		
1998-08	39,60	2002-08	17,89		
1998-09	62,82	2002-09	15,24		
1998-10	63,52	2002-10	175,25		
1998-11	24,07	2002-11	22,01		
1998-12	58,90	2002-12	34,94		
1999-01	26,42	2003-01	15,34		
1999-02	32,55	2003-02	131,15		
1999-03	20,43	2003-03	9,98		
1999-04	59,32	2003-04	73,61		
1999-05	46,03	2003-05	9,02		
1999-06	49,84	2003-06	106,79		
1999-07	8,76	2003-07	172,26		
1999-08	13,27	2003-08	199,74		
1999-09	221,09	2003-09	87,11		
1999-10	48,81	2003-10	41,01		
1999-11	307,50	2003-11	44,45		
1999-12	46,88	2003-12	79,55		

Table 3-34 Turkish 'Social and Personal Activities' Import Data (in 000$)

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	159,14	2000-01	501,60	2004-01	831,11
1996-02	90,12	2000-02	632,81	2004-02	338,34
1996-03	137,39	2000-03	1096,61	2004-03	717,38
1996-04	208,57	2000-04	705,57	2004-04	1451,92
1996-05	217,91	2000-05	84661,89	2004-05	615,14
1996-06	184,40	2000-06	4494,36	2004-06	705,41
1996-07	303,11	2000-07	16126,54	2004-07	471,70
1996-08	170,80	2000-08	556,34	2004-08	733,20
1996-09	459,96	2000-09	4170,94	2004-09	815,87
1996-10	255,81	2000-10	366,73	2004-10	614,38
1996-11	5503,45	2000-11	435,25	2004-11	1025,41
1996-12	5013,84	2000-12	370,94	2004-12	1603,42
1997-01	390,96	2001-01	382,20	2005-01	857,31
1997-02	206,49	2001-02	271,44	2005-02	1271,05
1997-03	292,79	2001-03	1319,69	2005-03	1111,67
1997-04	323,16	2001-04	158,48	2005-04	1004,40
1997-05	644,43	2001-05	314,73	2005-05	765,73
1997-06	191,90	2001-06	464,12	2005-06	1237,30
1997-07	183,84	2001-07	7578,94	2005-07	763,72
1997-08	406,62	2001-08	553,81	2005-08	1542,99
1997-09	206,34	2001-09	190,66	2005-09	2022,42
1997-10	1574,74	2001-10	217,05	2005-10	1010,40
1997-11	1753,73	2001-11	817,33	2005-11	1155,74
1997-12	552,37	2001-12	318,14	2005-12	2722,00
1998-01	460,41	2002-01	331,17	2006-01	939,05
1998-02	457,52	2002-02	171,82	2006-02	1185,41
1998-03	519,42	2002-03	321,01	2006-03	1381,44
1998-04	626,32	2002-04	536,14	2006-04	1547,99
1998-05	348,42	2002-05	726,82	2006-05	880,38
1998-06	392,53	2002-06	426,29		
1998-07	371,95	2002-07	516,37		
1998-08	274,13	2002-08	452,42		
1998-09	480,78	2002-09	762,05		
1998-10	468,59	2002-10	385,25		
1998-11	295,45	2002-11	357,36		
1998-12	279,89	2002-12	432,59		
1999-01	253,15	2003-01	523,10		
1999-02	253,80	2003-02	394,10		
1999-03	1767,88	2003-03	790,85		
1999-04	392,37	2003-04	258,06		
1999-05	288,20	2003-05	559,57		
1999-06	2670,44	2003-06	397,22		
1999-07	416,67	2003-07	473,00		
1999-08	241,03	2003-08	625,12		
1999-09	465,34	2003-09	543,12		
1999-10	476,64	2003-10	1176,55		
1999-11	596,66	2003-11	188,65		
1999-12	491,30	2003-12	1047,46		

Model Description for 'Social and Personal Activities' Export Data
Model Type
Simple

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,492	.	,492	,492	,492	,492	,492	,492	,492	,492	,492
R-squared	-,003	.	-,003	-,003	-,003	-,003	-,003	-,003	-,003	-,003	-,003
RMSE	1250,816	.	1250,816	1250,816	1250,816	1250,816	1250,816	1250,816	1250,816	1250,816	1250,816
MAPE	550,282	.	550,282	550,282	550,282	550,282	550,282	550,282	550,282	550,282	550,282
MaxAPE	6997,174	.	6997,174	6997,174	6997,174	6997,174	6997,174	6997,174	6997,174	6997,174	6997,174
MAE	308,357	.	308,357	308,357	308,357	308,357	308,357	308,357	308,357	308,357	308,357
MaxAE	13175,043	.	13175,043	13175,043	13175,043	13175,043	13175,043	13175,043	13175,043	13175,043	13175,043
Normalized BIC	14,302	.	14,302	14,302	14,302	14,302	14,302	14,302	14,302	14,302	14,302

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
SocialX-Model_1	0	,492	-,003	1250,816	550,282	308,357	6997,174	13175,043	1,867	17	1,000	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
SocialX-Model_1	Forecast	199,58	199,58	199,58	199,58	199,58	199,58	199,58	199,58	199,58	199,58	199,58	199,58
	UCL	2675,30	2675,30	2675,30	2675,30	2675,30	2675,30	2675,30	2675,30	2675,30	2675,30	2675,30	2675,30
	LCL	-2276,13	-2276,13	-2276,13	-2276,13	-2276,13	-2276,13	-2276,13	-2276,13	-2276,13	-2276,13	-2276,14	-2276,14

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

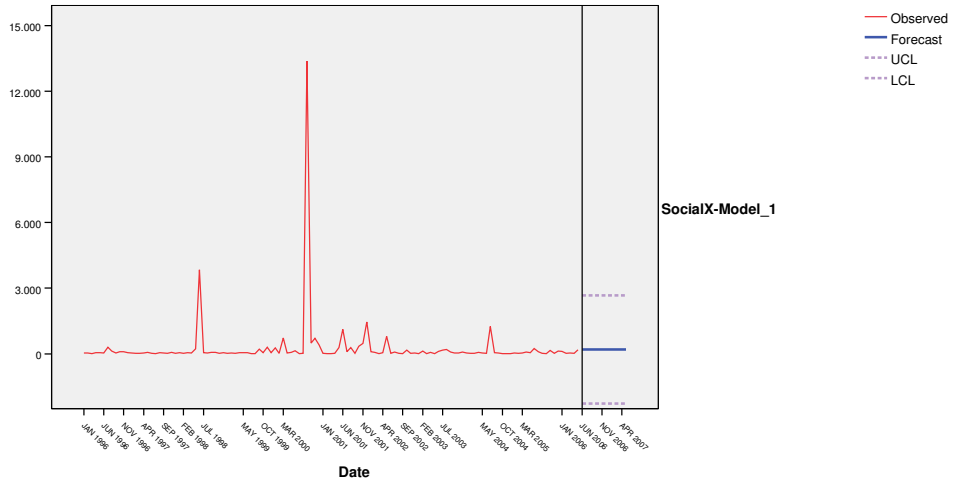

Figure 3-52 Model Description for 'Social and Personal Activities' Export Data

Model Description for 'Social and Personal Activities' Import Data
Model Type
Winters' Multiplicative

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,793	.	,793	,793	,793	,793	,793	,793	,793	,793	,793
R-squared	,198	.	,198	,198	,198	,198	,198	,198	,198	,198	,198
RMSE	6940,966	.	6940,966	6940,966	6940,966	6940,966	6940,966	6940,966	6940,966	6940,966	6940,966
MAPE	339,033	.	339,033	339,033	339,033	339,033	339,033	339,033	339,033	339,033	339,033
MaxAPE	5935,560	.	5935,560	5935,560	5935,560	5935,560	5935,560	5935,560	5935,560	5935,560	5935,560
MAE	2290,172	.	2290,172	2290,172	2290,172	2290,172	2290,172	2290,172	2290,172	2290,172	2290,172
MaxAE	64845,829	.	64845,829	64845,829	64845,829	64845,829	64845,829	64845,829	64845,829	64845,829	64845,829
Normalized BIC	17,806	.	17,806	17,806	17,806	17,806	17,806	17,806	17,806	17,806	17,806

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
SocialM-Model_1	0	,793	,198	6940,966	339,033	2290,172	5935,560	64845,829	4,299	15	,997	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
SocialM-Model_1	Forecast	1835,34	4035,77	1002,66	2260,40	1359,24	4275,38	4783,61	1027,52	2544,76	4877,54	1284,24	14711,32
	UCL	15575,67	24794,49	15599,89	26986,08	21753,52	64234,94	79770,83	23261,46	54639,56	111741,1	34460,40	394395,7
	LCL	-11905,0	-16723,0	-13594,6	-22465,3	-19035,0	-55684,2	-70203,6	-21206,4	-49550,0	-101986	-31891,9	-364973

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

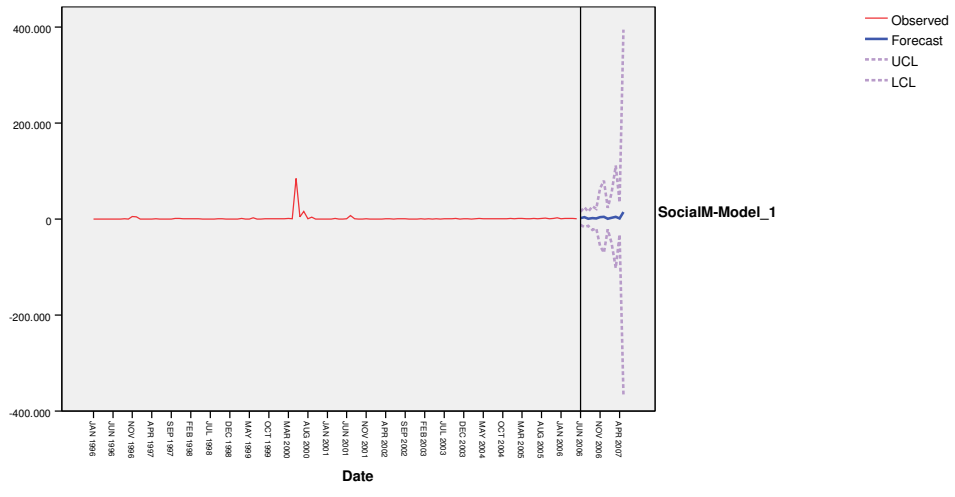

Figure 3-53 Model Description for 'Social and Personal Activities' Import Data

3.9 Applications of Forecasting Techniques on Turkish Manufacturing Export and Import by Subsectors

Manufacturing sector constitutes the largest share of Turkish export and import, hence it is important for both state and private organizations to analyze manufacturing sector closely in determining strategies and plans for future. The data for export and import values of manufacturing sectors were given in Appendix.

D	MANUFACTURING
15	Food products and beverages
16	Tobacco products
17	Textiles
18	Wearing apparel
19	Luggage, saddlery and footwear
20	Products of wood and cork
21	Paper and paper products
22	Printing and publishing
23	Coke, petroleum products and nuclear fuel
24	Chemicals and chemical products
25	Rubber and plastic products
26	Other non-metallic minerals
27	Manufacture of basic metals
28	Manufacture of fabricated metal prod(exc machinery)
29	Manufacture of machinery and equipment
30	Office, accounting and computing machinery
31	Electrical machinery and apparatus
32	Communication and apparatus
33	Medical, precision and optical instruments, watches
34	Motor vehicles and trailers
35	Other transport
36	Furniture

Table 3-35 Subsectors that constitute manufacturing sector

Model Description for Turkish Manufacturing Subsectors Export

			Model Type
Model ID	D15	Model_1	Winters' Multiplicative
	D16	Model_2	Simple Seasonal
	D17	Model_3	Winters' Additive
	D18	Model_4	Winters' Additive
	D19	Model_5	Simple Seasonal
	D20	Model_6	Winters' Additive
	D21	Model_7	Winters' Additive
	D22	Model_8	Winters' Multiplicative
	D23	Model_9	Winters' Multiplicative
	D24	Model_10	Winters' Additive
	D25	Model_11	Winters' Additive
	D26	Model_12	Winters' Additive
	D27	Model_13	Simple Seasonal
	D28	Model_14	ARIMA(0,1,6)(0,1,0)
	D29	Model_15	ARIMA(2,1,0)(0,1,0)
	D30	Model_16	Simple Seasonal
	D31	Model_17	Winters' Additive
	D32	Model_18	Winters' Additive
	D33	Model_19	Winters' Additive
	D34	Model_20	Winters' Multiplicative
	D35	Model_21	Simple Seasonal
	D36	Model_22	Winters' Multiplicative

Table 3-36 Model Description for Turkish Manufacturing Export by Subsectors

Model Fit

					Percentile						
Fit Statistic	Mean	SE	Minimum	Maximum	5	10	25	50	75	90	95
Stationary R-squared	,551	,120	,223	,711	,249	,403	,457	,570	,632	,696	,709
R-squared	,847	,182	,260	,978	,305	,575	,838	,913	,959	,971	,977
RMSE	18529,273	17427,238	1228,693	52633,521	1272,160	1522,126	2628,635	11823,849	28487,964	52145,391	52615,477
MAPE	16,922	14,306	6,271	60,263	6,412	7,216	7,789	12,866	18,929	45,661	59,423
MaxAPE	111,829	146,435	30,390	646,465	30,522	31,334	33,170	52,293	119,827	325,497	598,680
MAE	13570,418	12593,920	895,597	38772,755	925,155	1113,319	1947,518	8769,676	20640,084	37494,605	38770,890
MaxAE	67624,624	66189,987	4891,699	210846,8	4951,427	5474,735	9456,247	46153,964	94353,015	192018,7	208558,8
Normalized BIC	18,560	2,549	14,305	21,854	14,374	14,772	15,851	18,872	20,606	21,816	21,848

Table 3-37 Model Fit for Turkish Manufacturing Export by Subsectors

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
D15-Model_1	0	,411	,912	21973,650	7,870	16751,721	35,349	69610,841	29,927	15	,012	0
D16-Model_2	0	,685	,260	2374,154	23,924	1725,155	327,897	9823,193	13,342	16	,648	0
D17-Model_3	0	,623	,934	38452,193	6,271	28022,052	33,489	165400,9	37,437	15	,001	0
D18-Model_4	0	,603	,896	52513,225	7,209	38760,325	39,921	183676,6	51,980	15	,000	0
D19-Model_5	0	,561	,752	3465,590	12,865	2730,794	46,827	8355,409	25,309	16	,065	0
D20-Model_6	0	,611	,907	1752,671	17,264	1354,652	114,388	5906,051	12,187	15	,665	0
D21-Model_7	0	,600	,957	2713,461	9,961	2021,639	38,249	12242,969	46,795	15	,000	0
D22-Model_8	0	,646	,614	1518,472	24,652	1092,649	134,302	4891,699	17,221	15	,306	0
D23-Model_9	0	,627	,866	26420,976	54,664	18575,820	646,465	85401,329	15,151	15	,441	0
D24-Model_10	0	,522	,934	13630,625	7,546	10661,517	35,538	46212,391	62,537	15	,000	0
D25-Model_11	0	,400	,967	10564,060	7,472	7285,547	31,268	44210,381	31,545	15	,007	0
D26-Model_12	0	,436	,956	11780,022	7,235	8612,370	31,489	46864,978	26,682	15	,031	0
D27-Model_13	0	,486	,904	52633,521	13,498	38772,755	59,299	195593,9	14,422	16	,567	0
D28-Model_14	0	,540	,978	10368,090	8,572	7675,007	31,693	34263,647	18,627	15	,231	0
D29-Model_15	0	,573	,968	22126,347	9,631	17095,918	32,212	60599,196	17,589	16	,349	0
D30-Model_16	0	,698	,565	1228,693	24,004	895,597	115,646	5289,886	31,417	16	,012	0
D31-Model_17	0	,463	,913	11867,675	9,917	8926,982	30,390	46095,537	35,895	15	,002	0
D32-Model_18	0	,223	,930	24373,331	17,225	17382,342	107,756	86769,651	21,040	15	,136	0
D33-Model_19	0	,693	,889	1530,653	14,383	1161,550	58,042	7237,687	23,805	15	,068	0
D34-Model_20	0	,567	,972	51287,113	14,985	34541,257	132,369	210846,8	37,704	15	,001	0
D35-Model_21	0	,711	,599	34688,928	60,263	26832,878	319,897	117103,1	17,152	16	,376	0
D36-Model_22	0	,442	,968	10380,561	12,867	7670,671	57,759	41345,745	25,064	15	,049	0

Table 3-38 Model Statistics for Turkish Manufacturing Export by Subsectors

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
D15-Model_1	Forecast	316771	330913	345321	427994	466354	416639	400455	317708	327825	366196	333365	345344
	UCL	360270	378564	397093	488250	532386	480914	465824	377736	391671	437188	402491	418489
	LCL	273272	283262	293549	367737	400322	352364	335086	257680	263979	295203	264239	272200
D16-Model_2	Forecast	11612	10982	12514	12406	12163	11919	12037	10782	10968	13021	12890	12430
	UCL	16312	16043	17913	18123	18181	18224	18615	17624	18063	20361	20466	20236
	LCL	6913	5921	7115	6690	6145	5615	5458	3940	3873	5681	5313	4623
D17-Model_3	Forecast	737004	773740	757783	771644	783707	763305	739236	682920	653114	714993	671163	705610
	UCL	813124	850428	835413	850670	864653	846748	825791	773219	747794	814683	776472	817123
	LCL	660884	697051	680153	692618	702761	679861	652682	592621	558434	615303	565854	594098
D18-Model_4	Forecast	803534	844342	799414	755434	755712	729314	776212	796474	773375	854649	762669	752863
	UCL	907489	950889	909309	869476	874722	854117	907620	935275	920323	1010462	928023	928400
	LCL	699579	737794	689519	641393	636702	604511	644803	657673	626427	698837	597314	577326
D19-Model_5	Forecast	32164	30235	31128	32951	34130	31852	27381	27368	29452	35629	34345	37610
	UCL	39024	37622	39007	41293	42911	41050	36979	37350	39803	46337	45398	48998
	LCL	25304	22848	23249	24608	25349	22653	17783	17386	19101	24921	23292	26223
D20-Model_6	Forecast	20547	21088	21398	21152	20751	21315	21840	21459	21833	22400	22104	23865
	UCL	24017	24719	25182	25084	24826	25527	26186	25934	26433	27123	26946	28823
	LCL	17078	17458	17613	17220	16677	17103	17495	16984	17232	17677	17262	18906
D21-Model_7	Forecast	47116	48008	47072	48686	48103	48348	50073	46494	47390	51104	48116	50241
	UCL	52488	53606	52925	54820	54544	55119	57199	53996	55291	59423	56872	59453
	LCL	41745	42409	41219	42552	41663	41576	42947	38991	39490	42786	39360	41030
D22-Model_8	Forecast	10038	10786	11718	13341	8850	6920	9678	5977	6648	6955	6611	7541
	UCL	13044	13800	14749	16406	11898	9967	12810	9053	9778	10148	9843	10927
	LCL	7032	7772	8687	10275	5801	3872	6545	2901	3517	3762	3379	4155
D23-Model_9	Forecast	252881	227067	250023	255322	253797	241967	381408	277684	202952	344228	337389	317251
	UCL	305184	280044	304201	310564	309993	298773	446673	338049	260387	412854	406905	386362
	LCL	200578	174089	195844	200080	197601	185161	316144	217320	145518	275602	267873	248140
D24-Model_10	Forecast	269730	275176	275182	281911	287103	279203	285239	274574	286577	311875	303359	315700
	UCL	296713	303353	304625	312688	319282	312847	320408	311326	324968	351958	345186	359320
	LCL	242747	246999	245739	251133	254924	245560	250070	237821	248186	271791	261532	272081
D25-Model_11	Forecast	232138	234070	230374	245524	231335	222952	242361	192880	249449	275952	251629	271982
	UCL	253051	256167	253701	270123	257250	250222	271024	222973	281007	309009	286218	308135
	LCL	211226	211974	207048	220924	205420	195683	213698	162787	217892	242895	217040	235829
D26-Model_12	Forecast	233141	230048	236132	247389	225229	199711	234453	167575	227965	262210	234988	258116
	UCL	256461	254292	261266	273384	252058	227348	262876	196764	257900	292873	266363	290188
	LCL	209821	205804	210997	221394	198401	172074	206029	138386	198030	231546	203613	226045
D27-Model_13	Forecast	645438	624604	612990	625358	642759	636017	677525	622481	623997	685042	653565	713163
	UCL	749623	743943	745765	770329	798977	802725	854100	808401	818814	888367	865056	932516
	LCL	541253	505265	480214	480387	486541	469309	500949	436561	429180	481717	442074	493809
D28-Model_14	Forecast	249872	228601	258170	282242	267580	259888	300431	203589	261257	321402	271372	299045
	UCL	270240	249177	278947	305280	292660	286835	331415	238144	299045	362164	314905	345189
	LCL	229505	208024	237393	259204	242499	232941	269447	169034	223469	280640	227839	252901
D29-Model_15	Forecast	484145	480458	498388	491159	492342	455233	607333	357095	482039	569747	520133	562821
	UCL	527982	524315	546057	544986	546991	513807	668689	420178	548123	637927	590366	635415
	LCL	440308	436600	450719	437331	437693	396659	545977	294013	415956	501567	449899	490226
D30-Model_16	Forecast	6717	7112	6527	7312	7663	7888	8165	6438	6861	8003	7486	7218
	UCL	9149	9651	9169	10053	10500	10817	11183	9543	10051	11276	10839	10650
	LCL	4284	4572	3885	4571	4827	4959	5146	3332	3671	4731	4134	3787
D31-Model_17	Forecast	201591	207072	201673	215419	218704	217190	225142	220328	224785	239276	235563	247724
	UCL	225084	231789	227676	242766	247450	247387	256842	253578	259631	275764	273734	287620
	LCL	178097	182355	175670	188073	189959	186992	193443	187078	189938	202789	197392	207828
D32-Model_18	Forecast	218571	223515	275115	328986	400136	399704	459987	201220	307197	360664	311577	272267
	UCL	266821	272758	325331	380157	452244	452733	513921	256045	362898	417227	368990	330516
	LCL	170322	174273	224899	277815	348027	346675	406052	146396	251497	304101	254165	214017
D33-Model_19	Forecast	18989	19544	18489	19605	19147	19557	20967	19593	19450	21091	20207	21153
	UCL	22019	22639	21655	22850	22478	22981	24491	23225	23196	24958	24201	25280
	LCL	15959	16450	15323	16361	15816	16133	17443	15962	15704	17224	16213	17025
D34-Model_20	Forecast	1027214	1056747	719871	1023180	1086685	1016345	1231658	843930	973153	1247209	1212796	1295809
	UCL	1128742	1164518	827170	1147030	1219388	1150630	1386290	976291	1121138	1426329	1393952	1491584
	LCL	925686	948976	612573	899329	953982	882060	1077026	711568	825167	1068088	1031640	1100034
D35-Model_21	Forecast	145449	161365	147177	145840	167120	163689	158435	181017	142815	170230	167438	170313
	UCL	214113	231391	218539	218513	241081	238916	234908	258715	221718	250321	248700	252728
	LCL	76784	91338	75815	73167	93158	88462	81963	103320	63912	90139	86177	87898
D36-Model_22	Forecast	145244,6	136363,8	140348,1	160914,5	159516,0	148757,8	127635,4	100650,9	100539,6	117089,0	106664,8	103279,1
	UCL	165793,9	157973,1	164081,8	189357,3	192568,7	185810,1	166481,9	138603,1	144453,2	175271,3	169213,3	174071,9
	LCL	124695,2	114754,6	116614,3	132471,7	126463,3	111705,5	88788,9	62698,8	56626,0	58906,6	44116,4	32486,3

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

Table 3-39 Forecasts for Turkish Manufacturing Export by Subsectors

Model Description for Turkish Manufacturing Subsectors Import

			Model Type
Model ID	D15	Model_1	Simple Seasonal
	D16	Model_2	Simple Seasonal
	D17	Model_3	Simple Seasonal
	D18	Model_4	Winters' Multiplicative
	D19	Model_5	Winters' Multiplicative
	D20	Model_6	Winters' Additive
	D21	Model_7	Winters' Additive
	D22	Model_8	Simple Seasonal
	D23	Model_9	Winters' Additive
	D24	Model_10	Winters' Additive
	D25	Model_11	Winters' Additive
	D26	Model_12	Winters' Additive
	D27	Model_13	ARIMA(1,1,2)(1,0,0)
	D28	Model_14	Winters' Additive
	D29	Model_15	Winters' Multiplicative
	D30	Model_16	Simple Seasonal
	D31	Model_17	Winters' Additive
	D32	Model_18	Simple Seasonal
	D33	Model_19	Winters' Multiplicative
	D34	Model_20	Winters' Multiplicative
	D35	Model_21	Simple Seasonal
	D36	Model_22	Winters' Additive

Table 3-40 Model Description for Turkish Manufacturing Subsectors Import

Model Fit

					Percentile						
Fit Statistic	Mean	SE	Minimum	Maximum	5	10	25	50	75	90	95
Stationary R-squared	,499	,140	,273	,743	,274	,288	,396	,473	,626	,714	,742
R-squared	,836	,161	,410	,952	,414	,463	,834	,901	,920	,935	,950
RMSE	30993,970	31167,395	1440,136	104618,7	1781,887	4197,180	7005,553	17878,315	48371,603	87693,798	102466,2
MAPE	15,361	8,463	7,708	45,035	7,988	9,586	10,404	12,768	15,502	28,222	42,872
MaxAPE	86,926	67,482	36,079	343,433	36,799	41,212	54,606	67,955	86,407	175,690	320,755
MAE	22342,051	21878,273	1106,684	70460,120	1349,292	3014,033	4680,865	12954,130	36205,662	60551,976	68985,009
MaxAE	122594,0	134821,4	4846,696	506353,2	6695,282	18413,263	35509,608	70484,395	162814,6	374845,4	488811,8
Normalized BIC	19,721	2,274	14,622	23,272	14,913	16,772	17,792	19,677	21,676	22,877	23,221

Table 3-41 Model Fit for Turkish Manufacturing Import by Subsectors

Model Statistics

Model	Number of Predictors	Model Fit statistics							Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
D15-Model_1	0	,624	,754	20154,094	12,730	15732,806	76,801	54265,056	28,317	16	,029	0
D16-Model_2	0	,737	,524	1440,136	30,619	1106,684	192,250	4846,696	11,234	16	,795	0
D17-Model_3	0	,574	,896	24712,422	9,649	18291,794	40,876	93891,088	28,015	16	,031	0
D18-Model_4	0	,406	,918	5314,161	12,807	3690,622	56,103	24793,054	48,253	15	,000	0
D19-Model_5	0	,368	,915	6281,902	12,503	4330,922	68,672	26454,638	40,930	15	,000	0
D20-Model_6	0	,368	,936	3718,474	16,314	2724,067	82,607	17170,601	34,687	15	,003	0
D21-Model_7	0	,552	,914	11397,413	9,614	8532,692	75,130	38769,295	49,868	15	,000	0
D22-Model_8	0	,743	,436	7237,008	22,460	4424,733	115,366	39095,122	26,125	16	,052	0
D23-Model_9	0	,468	,906	46687,300	22,631	34909,809	137,050	166512,9	14,146	15	,514	0
D24-Model_10	0	,467	,952	76620,270	7,708	57079,855	50,522	249363,7	62,949	15	,000	0
D25-Model_11	0	,478	,933	11689,068	9,574	9072,589	36,079	40925,276	83,360	15	,000	0
D26-Model_12	0	,283	,910	6311,187	10,958	4766,242	59,849	21312,807	29,150	15	,015	0
D27-Model_13	0	,300	,918	104618,7	15,231	70460,120	56,793	506353,2	29,976	14	,008	0
D28-Model_14	0	,600	,869	13339,804	11,406	10255,333	55,967	38527,932	30,637	15	,010	0
D29-Model_15	0	,437	,888	81685,321	10,291	60626,049	61,745	340859,8	13,403	15	,571	0
D30-Model_16	0	,273	,891	18675,132	12,831	13406,419	97,806	68934,832	32,096	16	,010	0
D31-Model_17	0	,632	,928	24939,018	12,202	19175,877	43,910	82309,085	20,836	15	,142	0
D32-Model_18	0	,509	,838	41916,629	13,024	30831,631	67,239	158598,4	27,625	16	,035	0
D33-Model_19	0	,460	,895	17081,498	10,442	12501,841	41,994	72033,959	29,507	15	,014	0
D34-Model_20	0	,409	,930	90268,859	14,892	60379,139	77,010	389410,7	42,236	15	,000	0
D35-Model_21	0	,661	,410	53424,511	45,035	40093,220	343,433	161581,8	13,709	16	,620	0
D36-Model_22	0	,637	,823	14354,433	15,014	9132,678	75,172	101057,3	19,178	15	,206	0

Table 3-42 Model Statistics for Turkish Manufacturing Import by Subsectors

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
D15-Model_1	Forecast	217345	223537	225617	210957	201114	202587	207605	183236	186611	210717	202594	209002
	UCL	257238	266506	271455	259495	252211	256119	263466	241334	246862	273046	266935	275294
	LCL	177451	180568	179778	162418	150018	149055	151743	125138	126360	148387	138252	142709
D16-Model_2	Forecast	7298	7609	6887	7381	8249	8015	6901	6896	6738	8221	7241	7818
	UCL	10149	10516	9849	10398	11319	11138	10075	10122	10013	11546	10614	11239
	LCL	4448	4702	3924	4364	5178	4892	3726	3671	3462	4897	3868	4398
D17-Model_3	Forecast	320963	344707	332329	325400	323074	324977	336742	295116	300814	333809	310761	337238
	UCL	369879	397376	388498	384865	385662	390539	405148	366253	374581	410116	389526	418386
	LCL	272046	292039	276159	265934	260486	259416	268335	223978	227046	257502	231997	256091
D18-Model_4	Forecast	62579	74166	90378	108961	108456	84254	64493	50863	75091	96485	89945	80974
	UCL	73099	85348	102531	122402	122306	97175	76756	62792	89356	113347	106495	96917
	LCL	52059	62984	78224	95519	94607	71334	52230	38934	60826	79622	73395	65030
D19-Model_5	Forecast	60167	60728	93996	90654	78956	54348	62900	54892	109371	129544	93032	79122
	UCL	72603	74124	110491	107564	95452	69232	79525	71182	135611	160099	116838	100771
	LCL	47731	47332	77500	73744	62459	39464	46276	38601	83132	98989	69226	57473
D20-Model_6	Forecast	68413	69284	68432	67135	68066	65816	66643	64097	64964	67837	70801	72159
	UCL	75774	78645	79439	79574	81791	80718	82639	81118	82953	86748	90591	92793
	LCL	61052	59923	57426	54697	54341	50914	50648	47076	46975	48927	51011	51525
D21-Model_7	Forecast	185327	189298	184818	187176	183875	186468	190606	182059	182619	193890	190041	201555
	UCL	207889	214506	212419	216978	215727	220246	226205	219391	221607	234466	232146	245135
	LCL	162764	164090	157217	157374	152023	152691	155006	144727	143631	153314	147937	157976
D22-Model_8	Forecast	25441	28983	27797	28221	29868	29246	35825	27249	23590	27169	30906	26036
	UCL	39766	43592	42684	43381	45296	44938	51776	43455	40047	43873	47854	43225
	LCL	11116	14375	12911	13061	14440	13555	19874	11044	7133	10464	13958	8848
D23-Model_9	Forecast	587138	597684	630969	660842	676136	640371	718291	614183	640350	671456	658924	648611
	UCL	679560	701028	744185	783137	806880	779050	864476	767506	800494	838141	831905	827665
	LCL	494716	494341	517753	538548	545392	501691	572106	460860	480206	504770	485944	469557
D24-Model_10	Forecast	1609918	1609571	1597515	1672550	1652652	1636313	1671043	1624225	1675276	1816485	1769891	1830619
	UCL	1761596	1773645	1774173	1861987	1855068	1851911	1900029	1866806	1931657	2086874	2054494	2129642
	LCL	1458241	1445497	1420857	1483113	1450236	1420715	1442056	1381644	1418894	1546095	1485287	1531597
D25-Model_11	Forecast	219930	222710	213780	218055	219387	222312	223873	205918	210068	231048	225775	236471
	UCL	243070	247988	241031	247147	250212	254779	257904	241446	247034	269399	265464	277455
	LCL	196791	197432	186529	188963	188563	189845	189841	170390	173103	192697	186087	195487
D26-Model_12	Forecast	114602	115864	118185	119105	120430	125393	129355	120710	124652	135721	134624	142816
	UCL	127095	129175	132373	134225	136536	142534	147576	140057	145166	157441	157589	167060
	LCL	102108	102553	103997	103984	104324	108253	111133	101363	104138	114001	111660	118571
D27-Model_13	Forecast	1645366	1608248	1652675	1562150	1523140	1475967	1646065	1460486	1531439	1634427	1679766	1937385
	UCL	1851506	1876669	1944159	1890312	1875059	1855519	2048107	1885777	1977581	2101212	2165874	2442349
	LCL	1439226	1339826	1361192	1233989	1171220	1096414	1244023	1035196	1085297	1167643	1193658	1432421
D28-Model_14	Forecast	197344	206611	198803	202739	205809	206013	214136	191536	199256	214032	218989	233675
	UCL	223752	234239	227713	232991	237461	239119	248747	227702	237027	253452	260102	276525
	LCL	170937	178984	169892	172486	174157	172908	179525	155369	161486	174613	177875	190825
D29-Model_15	Forecast	1326171	1367962	1276839	1215814	1214677	1209884	1782850	963480	1040551	1289337	1194483	1366542
	UCL	1487876	1544377	1462674	1410638	1420946	1426637	2068040	1172185	1268182	1558704	1458709	1665149
	LCL	1164467	1191546	1091003	1020990	1008408	993130	1497659	754776	812919	1019971	930257	1067936
D30-Model_16	Forecast	230926	189975	207389	244722	234738	275912	322978	181395	218001	251395	196932	225344
	UCL	267892	231308	252669	293633	287027	331374	381442	242713	282046	318057	266111	296952
	LCL	193959	148642	162108	195812	182449	220449	264514	120076	153955	184734	127754	153737
D31-Model_17	Forecast	391249	392819	387265	412345	427604	428809	460393	422563	428478	451965	452591	469220
	UCL	440619	445775	443929	472836	492032	497282	533014	499432	509692	537616	542773	564020
	LCL	341880	339863	330600	351855	363175	360336	387772	345694	347265	366313	362410	374421
D32-Model_18	Forecast	375732	375284	368718	399768	398855	404960	430517	321162	355106	399147	385145	383480
	UCL	458703	468048	470336	509528	516193	529415	561703	458752	498813	548722	540366	544150
	LCL	292761	282520	267100	290009	281518	280505	299330	183573	211399	249572	229923	222811
D33-Model_19	Forecast	266042	257066	238283	260425	232989	253675	396494	225181	252318	303386	271610	284496
	UCL	299857	292416	274865	299499	272488	296124	452391	268257	299536	357823	324246	340579
	LCL	232228	221716	201700	221352	193490	211225	340597	182104	205099	248949	218973	228413
D34-Model_20	Forecast	1398890	1261134	1217099	1343767	1462854	1524621	1808588	896944	988235	1247376	1233462	1405562
	UCL	1577586	1457058	1429937	1584185	1730813	1813736	2148192	1129896	1249988	1567535	1562506	1780733
	LCL	1220194	1065211	1004261	1103348	1194895	1235507	1468985	663991	726483	927217	904418	1030390
D35-Model_21	Forecast	157665	200806	153017	114483	103143	113534	119318	125622	106545	127577	212186	170474
	UCL	263416	311214	267894	233661	226472	240880	250556	260642	245243	269858	357962	319663
	LCL	51915	90398	38140	-4695	-20187	-13811	-11921	-9398	-32153	-14703	66410	21285
D36-Model_22	Forecast	138174	141356	134356	141477	147848	145817	156383	132005	134036	153092	149112	157401
	UCL	166590	171021	165219	173493	180978	180024	191634	168271	171288	191305	188263	197467
	LCL	109758	111691	103493	109460	114718	111610	121131	95740	96783	114878	109962	117334

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

Table 3-43 Forecasts for Turkish Manufacturing Import by Subsectors

4. DISCUSSIONS AND EVALUATIONS

In Section 3.8.4, forecasts for manufacturing export were calculated with Winters' Additive model which presented in Figure 3-34 and in Section 3.9 forecasts were produced for 22 subsectors of manufacturing sector which presented in Table 3-39.

In Table 4-1, manufacturing export forecasts which presented in Figure 3-34 and manufacturing export forecasts which are gathered by adding subsectors forecasts presented in Table 3-39. Forecasts which were produced from sector data are higher than forecasts produced from subsectors, there is 4,84% deviation between two forecasts.

Period	Sector (Direct)	Sum of Subsectors	Difference	Percent Deviation
JUN 2006	6306485	6109907	196578	3,22
JUL 2006	6289978	6181837	108141	1,75
AUG 2006	6059561	5896807	162754	2,76
SEP 2006	6881113	6413770	467344	7,29
OCT 2006	6919754	6588886	330868	5,02
NOV 2006	6316699	6297714	18985	0,30
DEC 2006	7410748	6997651	413097	5,90
JAN 2007	5697097	5578237	118860	2,13
FEB 2007	6500003	5979642	520361	8,70
MAR 2007	7655906	6998965	656941	9,39
APR 2007	6839886	6525430	314456	4,82
MAY 2007	7178780	6791345	387435	5,70
Total	**80056010**	**76360190**	**3695820**	**4,84**

Table 4-1 Comparison of Sector Forecasts with Subsectors Forecasts for Export

In Table 4-2, manufacturing import forecasts which presented in Figure 3-45 and manufacturing import forecasts which are gathered by adding subsectors forecasts presented in Table 3-43. Import forecasts which were produced from sector data are less than forecasts produced from subsectors, a minor deviation of 0,38% exists between two forecasts.

Period	Sector (Direct)	Sum of Subsectors	Difference	Percent Deviation
JUN 2006	9503950	9606680	-102730	-1,07
JUL 2006	9265792	9545402	-279610	-2,93
AUG 2006	9417044	9425147	-8103	-0,09
SEP 2006	9522621	9594127	-71506	-0,75
OCT 2006	9280318	9621920	-341602	-3,55
NOV 2006	9215721	9619292	-403571	-4,20
DEC 2006	10917649	11051999	-134350	-1,22
JAN 2007	8026004	8349818	-323814	-3,88
FEB 2007	9312516	8854109	458407	5,18
MAR 2007	10611520	9994116	617404	6,18
APR 2007	10034291	9778811	255480	2,61
MAY 2007	10396107	10506000	-109893	-1,05
Total	**115503533**	**115947421**	**-443888**	**-0,38**

Table 4-2 Comparison of Sector Forecasts with Subsectors Forecasts for Import

In a similar manner, it is possible to produce forecasts for total Turkish Export or Import by using sectoral forecasts presented in Section 3.8.

Period	Sector A	Sector B	Sector C	Sector D	Sector E	Sector G	Sector K	Sector O
JUN 2006	236771	7365	85306	6306485	10665	27952	41,46	199,58
JUL 2006	211857	7738	91714	6289978	10107	26420	41,46	199,58
AUG 2006	195310	8030	87567	6059561	11981	25857	41,46	199,58
SEP 2006	314092	10697	89844	6881113	11349	27996	41,46	199,58
OCT 2006	373263	10357	92182	6919754	11499	27695	41,46	199,58
NOV 2006	352672	10435	90803	6316699	12188	27524	41,46	199,58
DEC 2006	335659	12257	95537	7410748	13519	27560	41,46	199,58
JAN 2007	289444	9092	89532	5697097	13919	27360	41,46	199,58
FEB 2007	286644	9895	89120	6500003	14136	27965	41,46	199,58
MAR 2007	301969	9019	99745	7655906	14359	31232	41,46	199,58
APR 2007	263673	7822	101668	6839886	13595	30481	41,46	199,58
MAY 2007	235990	7723	110691	7178780	15396	32005	41,46	199,58

Table 4-3 Sectoral Export Forecasts

Period	Sum of Sectoral forecasts	Direct Export Forecast	Difference	Percent Deviation
JUN 2006	6674785	6472065	202720	3,13
JUL 2006	6638055	6629560	8495	0,13
AUG 2006	6388547	6136031	252516	4,12
SEP 2006	7335332	6835712	499620	7,31
OCT 2006	7434991	7226457	208534	2,89
NOV 2006	6810562	6855074	-44512	-0,65
DEC 2006	7895521	7252593	642928	8,86
JAN 2007	6126685	6290690	-164005	-2,61
FEB 2007	6928004	6324622	603382	9,54
MAR 2007	8112471	7584528	527943	6,96
APR 2007	7257366	6956148	301218	4,33
MAY 2007	7580826	7256975	323851	4,46
Total	**85183145**	**81820455**	**3362690**	**4,11**

Table 4-4 Comparison of Sum of Sector Forecasts with Direct Export Forecasts

Total export forecasts which were produced directly are less than forecasts produced from sectors, a deviation of 4,11% exists between two forecasts.

Period	Sector A	Sector B	Sector C	Sector D	Sector E	Sector G	Sector K	Sector O
JUN 2006	257557	1144	1763059	9503950	1709	312321	176	1835
JUL 2006	248920	1270	1832250	9265792	1709	306314	305	4036
AUG 2006	234428	1423	1900527	9417044	1709	320412	574	1003
SEP 2006	193184	6062	1909790	9522621	1709	338680	232	2260
OCT 2006	179449	1565	1975577	9280318	1709	314762	123	1359
NOV 2006	192974	2162	2003328	9215721	1709	329903	389	4275
DEC 2006	224649	4370	2092321	10917649	1709	342315	416	4784
JAN 2007	210669	769	2085138	8026004	1709	312812	112	1028
FEB 2007	216470	1893	2061253	9312516	1709	320946	347	2545
MAR 2007	265828	2325	2136430	10611520	1709	365000	135	4878
APR 2007	254639	2460	2130330	10034291	1709	360581	398	1284
MAY 2007	269744	1863	2150306	10396107	1709	335658	151	14711

Table 4-5 Sectoral Import Forecasts

Period	Sum of Sectoral forecasts	Direct Import Forecast	Difference	Percent Deviation
JUN 2006	11841751	11940925	99174	0,83
JUL 2006	11660596	11758863	98267	0,84
AUG 2006	11877119	12292396	415277	3,38
SEP 2006	11974539	12312137	337598	2,74
OCT 2006	11754862	12127400	372538	3,07
NOV 2006	11750461	11839963	89502	0,76
DEC 2006	13588213	13251152	-337061	-2,54
JAN 2007	10638241	10753997	115756	1,08
FEB 2007	11917678	11923423	5745	0,05
MAR 2007	13387824	13182673	-205151	-1,56
APR 2007	12785692	13168435	382743	2,91
MAY 2007	13170250	13621869	451619	3,32
Total	**146347227**	**148173233**	**1826006**	**1,23**

Table 4-6 Comparison of Sum of Sector Forecasts with Direct Import Forecasts

Total import forecasts which were produced directly are less than forecasts produced from sectors, a deviation of 1,23% exists between two forecasts.

A method of inductive forecasting, producing forecasts from subsectors to main sectors and from there to total export or import values, would be more suitable in terms of reducing forecasting errors.

A second point in producing forecasts is the past data values; time series beginning from January 1996 up to May 2006 were used to predict next year values. A close examination of time series plots of export and import values presented in Figures 3-1 and 3-2 reveals that export and import values are nearly stationary between periods 1996 and 2001. After 2001 economic crises, an upward trend is observed in both export and import values. Values before and after 2001 crises are compared in Figures 4-1 and 4-2. Forecasts may be revised by taking 2002-2006 values into consideration, omitting 1996-2001 values. Revised forecasts are shown in Figures 4-3 and 4-4.

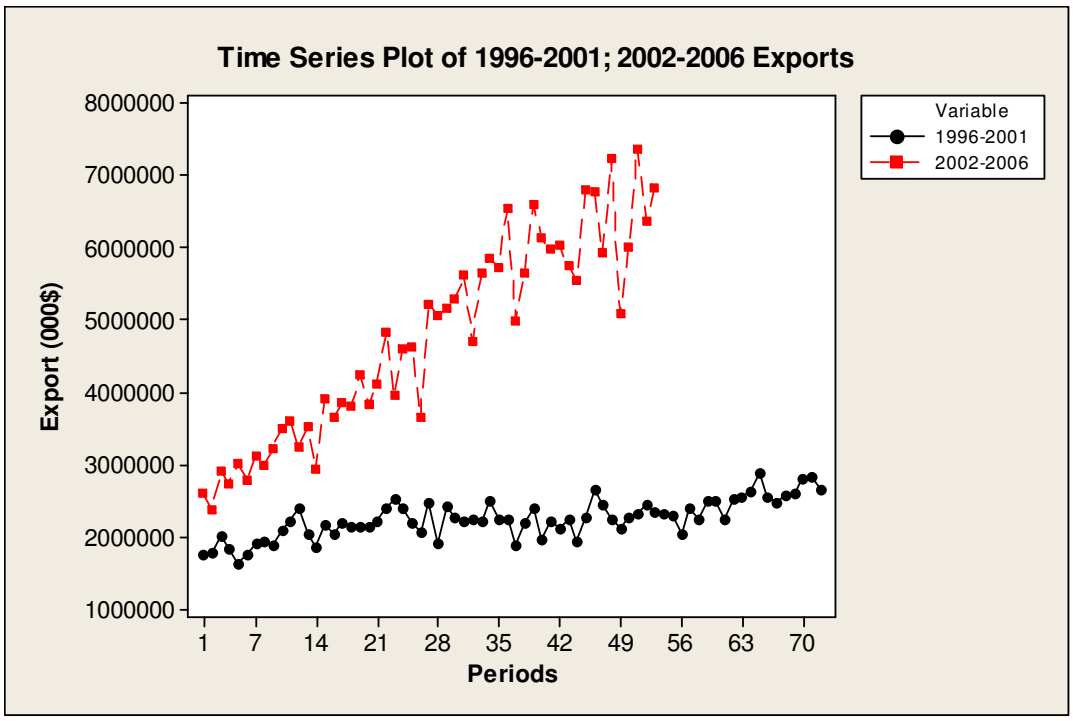

Figure 4-1 Comparison of Export Values for Periods 1996-2001 and 2002-2006

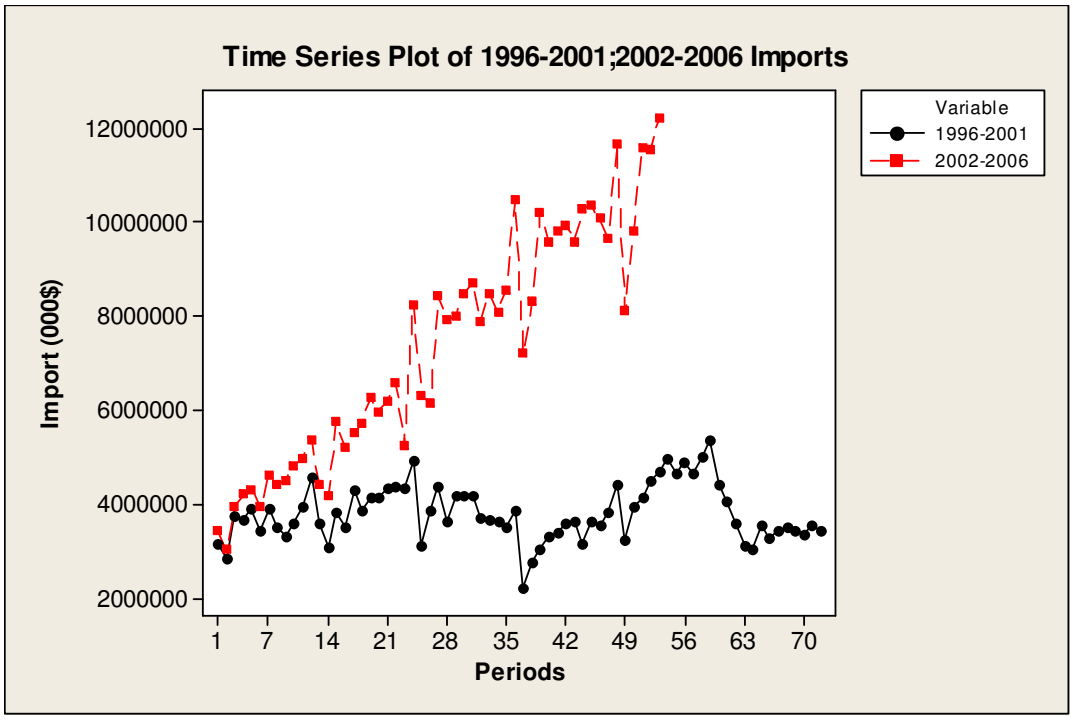

Figure 4-2 Comparison of Import Values for Periods 1996-2001 and 2002-2006

Model Description for Export Data Based on Period 2002-2006 Data
Model Type
Winters's Additive

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	,651	.	,651	,651	,651	,651	,651	,651	,651	,651	,651
R-squared	,941	.	,941	,941	,941	,941	,941	,941	,941	,941	,941
RMSE	344612,0	.	344612,0	344612,0	344612,0	344612,0	344612,0	344612,0	344612,0	344612,0	344612,0
MAPE	6,151	.	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151	6,151
MaxAPE	22,694	.	22,694	22,694	22,694	22,694	22,694	22,694	22,694	22,694	22,694
MAE	272280,4	.	272280,4	272280,4	272280,4	272280,4	272280,4	272280,4	272280,4	272280,4	272280,4
MaxAE	1156785	.	1156785	1156785	1156785	1156785	1156785	1156785	1156785	1156785	1156785
Normalized BIC	25,725	.	25,725	25,725	25,725	25,725	25,725	25,725	25,725	25,725	25,725

Model Statistics

Model	Number of Predictors	Model Fit statistics						Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	Statistics	DF	Sig.	
VAR00001-Model_1	0	,651	,941	344612,0	6,151	272280,4	22,694	29,693	15	,013	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
VAR00001-Model_1	Forecast	6904526	7115999	6698361	7382988	7673399	7242056	7838252	7104244	7060368	8136632	7729099	7902431
	UCL	7596700	7811721	7397614	8085754	8379661	7951796	8551454	7820892	7780445	8860122	8455986	8632699
	LCL	6212353	6420277	5999108	6680222	6967138	6532315	7125049	6387596	6340291	7413142	7002212	7172162

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

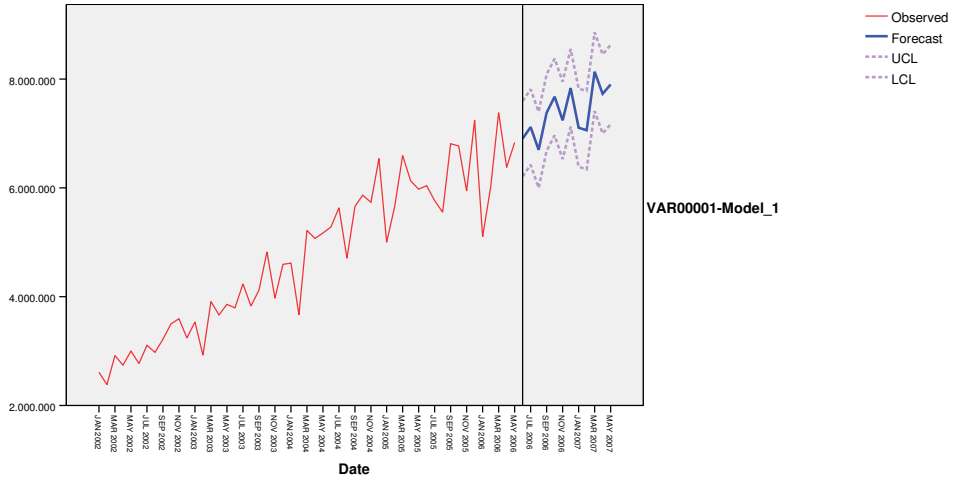

Figure 4-3 Model Description for Export Data Based on Period 2002-2006 Data

Model Description for Import Data Based on Period 2002-2006 Data
Model Type
Winters's Additive

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile 5	10	25	50	75	90	95
Stationary R-squared	,698	.	,698	,698	,698	,698	,698	,698	,698	,698	,698
R-squared	,966	.	,966	,966	,966	,966	,966	,966	,966	,966	,966
RMSE	470490,4	.	470490,4	470490,4	470490,4	470490,4	470490,4	470490,4	470490,4	470490,4	470490,4
MAPE	5,605	.	5,605	5,605	5,605	5,605	5,605	5,605	5,605	5,605	5,605
MaxAPE	32,173	.	32,173	32,173	32,173	32,173	32,173	32,173	32,173	32,173	32,173
MAE	347738,7	.	347738,7	347738,7	347738,7	347738,7	347738,7	347738,7	347738,7	347738,7	347738,7
MaxAE	1481448	.	1481448	1481448	1481448	1481448	1481448	1481448	1481448	1481448	1481448
Normalized BIC	26,348	.	26,348	26,348	26,348	26,348	26,348	26,348	26,348	26,348	26,348

Model Statistics

Model	Number of Predictors	Model Fit statistics: Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Ljung-Box Q(18): Statistics	DF	Sig.	Number of Outliers
VAR00001-Model_1	0	,698	,966	470490,4	5,605	347738,7	32,173	1481448	24,144	15	,063	0

Forecast

Model		JUN 2006	JUL 2006	AUG 2006	SEP 2006	OCT 2006	NOV 2006	DEC 2006	JAN 2007	FEB 2007	MAR 2007	APR 2007	MAY 2007
VAR00001-Model_1	Forecast	11589961	11868283	11707577	11962271	11966002	11682406	13510441	11394317	11781713	13470050	13187705	13453724
	UCL	12534969	12817988	12661956	12921302	12929662	12650672	14483291	12371732	12763669	14456528	14178684	14449184
	LCL	10644953	10918579	10753198	11003241	11002343	10714141	12537590	10416903	10799756	12483572	12196727	12458265

For each model, forecasts start after the last non-missing in the range of the requested estimation period, and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

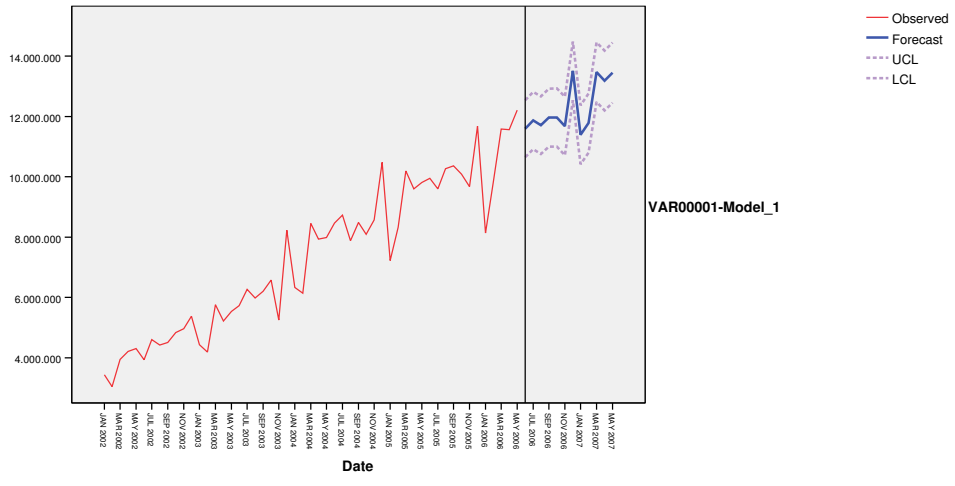

Figure 4-4 Model Description for Import Data Based on Period 2002-2006 Data

CONCLUSION AND IMPLICATIONS

In the scope of this thesis, several forecasting techniques were applied on Turkish foreign trade data. Forecasts for period June 2006- June 2007 were produced for total export and import, for sectors and then subsectors and industries. Forecasts were based on the analysis of the time series data beginning from January 1996 up to May 2006.

Forecast for Turkish total export and import are especially important for macroeconomic purposes. Based on the forecasts, Turkish import values will be higher than export values, ranging from 4 to 6 billion dollars for the next twelve months. Trade deficit between export and import should be analyzed especially by state and government institutions in determining policies and strategies, since the share of foreign trade in overall economy is high.

Sectoral forecasts are especially important for business organizations and unions since they convey information about the future of the sectors which then can be used in determining marketing and management strategies.

For short term forecasting, it would be good idea to use forecasts based on recent data such as periods starting from year 2002. Collecting data and selecting an acceptable forecasting technique are only among the first steps in an effective, ongoing forecasting effort. From time to time it is necessary to pause in the forecasting process and reconsider the procedures being used.

Monetary unit used in analysis of data is US Dollars, however much of trade is done in EU Euro; hence changes in Euro/Dollar parity may cause deviations from forecasted values. In similar manner, appreciation or depreciation of YTL against Dollar and Euro will affect Turkish foreign trade.

“Regardless of the mathematical complexity of the model, the statistical sophistication of the method, the large number of data, and the power of the computer being utilized, forecasting can never become a substitute for prophecy. Any and all types of statistical predictions are simply extrapolations of established past patterns

and/or existing relationships. Even the majority of judgmental forecasts are based on extrapolating patterns/relationships. For these forecasts to be accurate, therefore, one of the two things must happen: either no major changes must occur from the conditions that have prevailed during the past, or such changes must cancel themselves out. Otherwise, forecasting errors, sometimes large ones, are possible (their size will usually, be proportional to the magnitude of changes involved), unless we can develop appropriate foresight about the direction and extent of the forthcoming changes based on means other than extrapolation"[85].

[85] Makridakis et al., *Forecasting: Methods and Applications,* p.550.

BIBLIOGRAPHY

Books

Armstrong, J. Scott, (Editor).,**Principles of Forecasting: A Handbook for Researchers and Practitioners**, Hingham, MA, USA: Kluwer Academic Publishers, 2001.

Bails, Dale G., Peppers, Larry C., **Business Fluctuations: Forecasting Techniques and Applications**, USA: Prentice-Hall Inc., 1982.

Box, G. E. P., Jenkins, G. M., and G. C. Reinsel, **Time Series Analysis: Forecasting and Control** (3rd ed.), Upper Saddle River, New Jersey: Prentice Hall, 1994.

Carnot, Nicholas., **Economic Forecasting**, Gordonsville, VA, USA: Palgrave Macmillan, 2005.

Chisholm, Roger K., Whitaker, Gilbert R. Jr., **Forecasting Methods,** USA: Richard D. Irwin Inc., 1972.

Evans, Robert., **Macroeconomic Forecasting : A Sociological Appraisal**, London, GBR: Routledge, 1999.

Everitt, Brian S., **Cambridge Dictionary of Statistics,** West Nyack, NY, USA: Cambridge University Press, 2002. p 149.

Hanke John E. and Wichern, Dean W., **Business Forecasting**, 8th Edition, USA: Pearson Prentice Hall, 2005.

Hanssens, Dominique M. **Market Response Models. Econometric and Time Series Analysis,** 2nd Edition, Hingham, MA, USA: Kluwer Academic Publishers, 2001.

Makridakis, Spyros., Wheelwright, Steven C., and Hyndman, Rob J., **Forecasting: methods and applications**, 3rd Edition, USA: John Wiley& Sons, 1998.

Makridakis, Spyros., **The Forecasting Accuracy of Major Time Series Methods**, Great Britain: John Wiley & Sons, 1984.

Montgomery, Douglas C., Johnson, Lynwood A., Gardiner, John S., **Forecasting and Time Series Analysis**, 2nd Edition, USA: McGraw-Hill, Inc., 1990.

Newbold, Paul and Bos, Theodore, **Introductory Business and Economic Forecasting**, 2nd Edition, USA: South-Western Publishing Co., 1994.

Render, Barry and Stair, Ralph M. Jr., **Quantitative Analysis for Management**, 7th Edition, USA: Prentice-Hall, Inc., 2000.

Journals

Armstrong, J. Scott and Collopy, Fred, "Error Measures For Generalizing About Forecasting Methods: Empirical Comparisons", **International Journal of Forecasting**, 8 (1992), p. 69-80.

Cuhls, Kerstin. "From Forecasting to Foresight Processes—New Participative Foresight Activities in Germany" **Journal of Forecasting** 22, p.93, 2003.

Fildes, Robert. "Evaluation of Aggregate and Individual Forecast Method Selection Rules", **Management Science**, Vol. 35, No.9. (Sep., 1989), p.1056.

Gooijer, Jan G. De and Fransesb, Philip Hans, "Forecasting and seasonality", **International Journal of Forecasting**, 13 (1997), p. 303-305.

Hogarth, Robin M. and Makridakis, Spyros "Forecasting and Planning: An Evaluation", **Management Science**, Vol. 27, No. 2. (Feb., 1981), p.115.

Holt, Charles C., "Forecasting seasonals and trends by exponentially weighted moving averages", **International Journal of Forecasting,** 20 (2004) p. 5– 10.

Jain, L. Chaman., "Business Forecasting Practices in 2003", **The Journal of Business Forecasting Methods & Systems;** Fall 2004; 23, 3; ABI/INFORM Global pg. 2.

Jain, L. Chaman " Benchmarking Forecasting Errors", **The Journal of Business Forecasting;** Winter 2005/2006; 24, 4; ABI/INFORM Global pg. 13

Koehler, Anne B., Snyder, Ralph D. and Ord, J. Keith., "Forecasting models and prediction intervals for the multiplicative Holt–Winters method", **International Journal of Forecasting**, 17 (2001) p. 269–286.

Lawless, Mark J., "Forecasting in the 1990's", **The Journal of Business Forecasting Methods & Systems***;* Fall 1997; 16, 3; ABI/INFORM Global pg. 9.

Ledolter, Johannes and Abraham, Bovas, "Some Comments on the Initialization of Exponential Smoothing"**, Journal of Forecasting**, Vol. 3, 1, Jan-Mar 1984, p.79.

Mosheiov G. and Raveh, A., "On Trend Estimation of Time-Series: A Simpler Linear Programming Approach", **The Journal of the Operational Research Society,** Vol. 48, No. 1. (Jan., 1997), p. 90-96.

Rotheli, Tobias F., "Forecasting among Alternative Strategies in the Management of Uncertainty", **Managerial and Decision Economics**, Vol. 19, No. 3. (May, 1998), p. 179.

Internet

Armstrong, J. Scott. "Forecasting Principles, Forecasting Dictionary", http://armstrong.wharton.upenn.edu/dictionary/definitions/forecasting.html (February 6, 2006).

Armstrong, J. Scott. "Strategic Planning And Forecasting Fundamentals", General Economics and Teaching 0502066, EconWPA, http://129.3.20.41/eps/get/papers/0502/0502066.pdf (June, 2006).

"Economic Forecasting", *Encyclopædia Britannica. 2006*. Encyclopædia Britannica Premium Service. http://www.britannica.com/eb/article-25801 (June 2006).

Merriam-Webster Online Dictionary, http://www.m-w.com/dictionary/forecast (February, 2006).

Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Stanford, Richard A., "Time Series Forecasting Rules", *Economic Forecasting*, http://facweb.furman.edu/~dstanford/forecast/h3.htm (June, 2006).

Turkish Daily News, "Development of Turkish Foreign Trade", http://www.turkishdailynews.com.tr/archives.php?id=9528 (April, 2006).

Undersecreteriat of The Prime Ministry for Foreign Trade, http://www.dtm.gov.tr/ead/english/basinyayin.doc (April, 2006).

Software

MINITAB® Release 14.20

SPSS Release 14.0.0

MICROSOFT® OFFICE EXCEL 2003

APPENDIX

'Food products and beverages' Export Data (in 000$) D15

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	185304	2000-01	121448	2004-01	244063
1996-02	178211	2000-02	136410	2004-02	196509
1996-03	194416	2000-03	134819	2004-03	272636
1996-04	173526	2000-04	156298	2004-04	248356
1996-05	167626	2000-05	147774	2004-05	233510
1996-06	179013	2000-06	137454	2004-06	234285
1996-07	181382	2000-07	137407	2004-07	263528
1996-08	190712	2000-08	143054	2004-08	260480
1996-09	210673	2000-09	186939	2004-09	347218
1996-10	256557	2000-10	182661	2004-10	352569
1996-11	269680	2000-11	188101	2004-11	330077
1996-12	267993	2000-12	163141	2004-12	366194
1997-01	204872	2001-01	138592	2005-01	274041
1997-02	178367	2001-02	161789	2005-02	326236
1997-03	217690	2001-03	157038	2005-03	362254
1997-04	231233	2001-04	168770	2005-04	319594
1997-05	247705	2001-05	173628	2005-05	334916
1997-06	214316	2001-06	145379	2005-06	310316
1997-07	202999	2001-07	146719	2005-07	297757
1997-08	223856	2001-08	153663	2005-08	326703
1997-09	243819	2001-09	195692	2005-09	447924
1997-10	285437	2001-10	224922	2005-10	469278
1997-11	259420	2001-11	190408	2005-11	385975
1997-12	224461	2001-12	159635	2005-12	416667
1998-01	180788	2002-01	129446	2006-01	283292
1998-02	182155	2002-02	126638	2006-02	360199
1998-03	197384	2002-03	144709	2006-03	388739
1998-04	143012	2002-04	128608	2006-04	320134
1998-05	207353	2002-05	134582	2006-05	321437
1998-06	177265	2002-06	115909		
1998-07	183049	2002-07	142917		
1998-08	203742	2002-08	156844		
1998-09	213344	2002-09	195385		
1998-10	251944	2002-10	219892		
1998-11	221388	2002-11	209919		
1998-12	195209	2002-12	175885		
1999-01	127965	2003-01	194049		
1999-02	164333	2003-02	148795		
1999-03	167286	2003-03	195255		
1999-04	142445	2003-04	209407		
1999-05	164904	2003-05	208811		
1999-06	166407	2003-06	196174		
1999-07	161504	2003-07	212064		
1999-08	156788	2003-08	209931		
1999-09	201562	2003-09	247172		
1999-10	232937	2003-10	309289		
1999-11	185184	2003-11	262393		
1999-12	168614	2003-12	256218		

'Food products and beverages' Import Data (in 000$) D15

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	136837	2000-01	75920	2004-01	123336
1996-02	116039	2000-02	86113	2004-02	116503
1996-03	210711	2000-03	84219	2004-03	148152
1996-04	185723	2000-04	93896	2004-04	162107
1996-05	175566	2000-05	92376	2004-05	145765
1996-06	168948	2000-06	97943	2004-06	204139
1996-07	217564	2000-07	98339	2004-07	180370
1996-08	210721	2000-08	110183	2004-08	156628
1996-09	170322	2000-09	106942	2004-09	191873
1996-10	142222	2000-10	114697	2004-10	154028
1996-11	131506	2000-11	104160	2004-11	148163
1996-12	142516	2000-12	91188	2004-12	172951
1997-01	132870	2001-01	87859	2005-01	133896
1997-02	114360	2001-02	68348	2005-02	154353
1997-03	130247	2001-03	57709	2005-03	181207
1997-04	107790	2001-04	60682	2005-04	166638
1997-05	164871	2001-05	79494	2005-05	154059
1997-06	152123	2001-06	78279	2005-06	226856
1997-07	150788	2001-07	81399	2005-07	197472
1997-08	156975	2001-08	98996	2005-08	202733
1997-09	175697	2001-09	84182	2005-09	168693
1997-10	160105	2001-10	97309	2005-10	167918
1997-11	158540	2001-11	126534	2005-11	171160
1997-12	157177	2001-12	93298	2005-12	189193
1998-01	114023	2002-01	108606	2006-01	121300
1998-02	134717	2002-02	88078	2006-02	163640
1998-03	127031	2002-03	116445	2006-03	219945
1998-04	111588	2002-04	97271	2006-04	205777
1998-05	108118	2002-05	116810	2006-05	221867
1998-06	139120	2002-06	112279		
1998-07	154658	2002-07	128432		
1998-08	168931	2002-08	130813		
1998-09	103465	2002-09	125498		
1998-10	95108	2002-10	99639		
1998-11	106065	2002-11	128725		
1998-12	90098	2002-12	109346		
1999-01	59910	2003-01	92829		
1999-02	89600	2003-02	92763		
1999-03	92859	2003-03	121150		
1999-04	84193	2003-04	124660		
1999-05	80142	2003-05	131746		
1999-06	92870	2003-06	147962		
1999-07	85999	2003-07	187421		
1999-08	83465	2003-08	183798		
1999-09	100611	2003-09	129359		
1999-10	81093	2003-10	146101		
1999-11	97325	2003-11	100773		
1999-12	101946	2003-12	175411		

'Tobacco products' Export Data (in 000$) D16

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	8289	2000-01	7340	2004-01	6909
1996-02	4545	2000-02	9203	2004-02	5881
1996-03	8119	2000-03	9764	2004-03	6712
1996-04	7372	2000-04	18666	2004-04	9102
1996-05	5300	2000-05	11045	2004-05	6676
1996-06	6391	2000-06	7275	2004-06	8235
1996-07	6283	2000-07	12607	2004-07	6350
1996-08	12131	2000-08	11305	2004-08	6686
1996-09	6921	2000-09	10157	2004-09	5746
1996-10	9818	2000-10	5768	2004-10	5253
1996-11	9425	2000-11	9295	2004-11	4749
1996-12	10519	2000-12	10629	2004-12	5746
1997-01	5611	2001-01	6797	2005-01	7755
1997-02	6598	2001-02	7253	2005-02	8620
1997-03	6930	2001-03	8287	2005-03	11011
1997-04	6839	2001-04	5622	2005-04	9779
1997-05	8219	2001-05	6852	2005-05	11169
1997-06	16586	2001-06	6066	2005-06	11545
1997-07	11809	2001-07	5352	2005-07	7914
1997-08	9696	2001-08	4861	2005-08	13134
1997-09	10317	2001-09	4779	2005-09	11312
1997-10	10274	2001-10	8691	2005-10	10400
1997-11	16802	2001-11	5704	2005-11	8630
1997-12	8552	2001-12	10788	2005-12	10518
1998-01	6458	2002-01	8384	2006-01	7973
1998-02	7464	2002-02	5655	2006-02	10014
1998-03	9694	2002-03	9500	2006-03	12996
1998-04	5321	2002-04	9558	2006-04	12730
1998-05	7402	2002-05	10703	2006-05	13470
1998-06	3325	2002-06	7354		
1998-07	1105	2002-07	8940		
1998-08	5848	2002-08	8001		
1998-09	4932	2002-09	11495		
1998-10	6380	2002-10	6045		
1998-11	5164	2002-11	7612		
1998-12	5294	2002-12	6469		
1999-01	4703	2003-01	6000		
1999-02	5918	2003-02	7118		
1999-03	8932	2003-03	8909		
1999-04	5714	2003-04	8703		
1999-05	6498	2003-05	7014		
1999-06	3671	2003-06	7146		
1999-07	4480	2003-07	6452		
1999-08	7650	2003-08	7297		
1999-09	10602	2003-09	9276		
1999-10	12209	2003-10	8262		
1999-11	6815	2003-11	6468		
1999-12	6138	2003-12	7188		

'Tobacco products' Import Data (in 000$) D16

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	1129	2000-01	1287	2004-01	4009
1996-02	1141	2000-02	3258	2004-02	3622
1996-03	3676	2000-03	2904	2004-03	5462
1996-04	1864	2000-04	5934	2004-04	4481
1996-05	5554	2000-05	3770	2004-05	6049
1996-06	3914	2000-06	3702	2004-06	3955
1996-07	1922	2000-07	2969	2004-07	6174
1996-08	2339	2000-08	4044	2004-08	5812
1996-09	1078	2000-09	3333	2004-09	5087
1996-10	4089	2000-10	4107	2004-10	9352
1996-11	6038	2000-11	4451	2004-11	8688
1996-12	1349	2000-12	2783	2004-12	10639
1997-01	5504	2001-01	3417	2005-01	6290
1997-02	1347	2001-02	4155	2005-02	6353
1997-03	6053	2001-03	2825	2005-03	10765
1997-04	1533	2001-04	2562	2005-04	6937
1997-05	2168	2001-05	2347	2005-05	5657
1997-06	4571	2001-06	3385	2005-06	7961
1997-07	3899	2001-07	5278	2005-07	8605
1997-08	2548	2001-08	3439	2005-08	8587
1997-09	4580	2001-09	1230	2005-09	9277
1997-10	5049	2001-10	4213	2005-10	8640
1997-11	2758	2001-11	4717	2005-11	8263
1997-12	1827	2001-12	2243	2005-12	6126
1998-01	2785	2002-01	4265	2006-01	7500
1998-02	7380	2002-02	3099	2006-02	6610
1998-03	5010	2002-03	4536	2006-03	6241
1998-04	3276	2002-04	5812	2006-04	6260
1998-05	5891	2002-05	3460	2006-05	9183
1998-06	4983	2002-06	3362		
1998-07	4022	2002-07	4279		
1998-08	2736	2002-08	2818		
1998-09	6007	2002-09	3683		
1998-10	4840	2002-10	2435		
1998-11	2435	2002-11	4620		
1998-12	2517	2002-12	3460		
1999-01	2349	2003-01	5021		
1999-02	2768	2003-02	2075		
1999-03	6209	2003-03	4450		
1999-04	4775	2003-04	3912		
1999-05	3909	2003-05	5708		
1999-06	3437	2003-06	4344		
1999-07	3588	2003-07	5985		
1999-08	2557	2003-08	4618		
1999-09	4929	2003-09	5237		
1999-10	2694	2003-10	7698		
1999-11	4440	2003-11	4370		
1999-12	4143	2003-12	4550		

'Textiles' Export Data (in 000$) D17

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	253098	2000-01	347477	2004-01	668014
1996-02	237485	2000-02	346721	2004-02	466333
1996-03	281598	2000-03	336469	2004-03	643262
1996-04	250209	2000-04	383806	2004-04	611498
1996-05	223872	2000-05	358200	2004-05	613667
1996-06	305376	2000-06	406965	2004-06	631472
1996-07	350512	2000-07	434211	2004-07	724910
1996-08	394143	2000-08	396775	2004-08	631912
1996-09	366592	2000-09	427391	2004-09	726244
1996-10	376889	2000-10	385351	2004-10	754355
1996-11	382935	2000-11	405702	2004-11	727188
1996-12	395114	2000-12	385009	2004-12	799207
1997-01	337521	2001-01	360348	2005-01	595984
1997-02	281258	2001-02	368378	2005-02	653925
1997-03	312899	2001-03	358372	2005-03	741647
1997-04	288889	2001-04	372436	2005-04	708853
1997-05	359226	2001-05	427237	2005-05	682161
1997-06	373900	2001-06	434791	2005-06	697452
1997-07	417827	2001-07	417268	2005-07	748149
1997-08	422401	2001-08	460174	2005-08	736054
1997-09	421592	2001-09	440543	2005-09	827461
1997-10	414867	2001-10	449035	2005-10	810733
1997-11	445729	2001-11	468547	2005-11	739630
1997-12	374008	2001-12	386369	2005-12	800656
1998-01	362214	2002-01	381931	2006-01	551548
1998-02	316653	2002-02	348121	2006-02	678261
1998-03	402907	2002-03	413740	2006-03	769345
1998-04	307631	2002-04	391296	2006-04	671216
1998-05	396499	2002-05	459574	2006-05	717059
1998-06	411287	2002-06	468602		
1998-07	432876	2002-07	524907		
1998-08	437793	2002-08	522951		
1998-09	410171	2002-09	500684		
1998-10	481917	2002-10	519885		
1998-11	435974	2002-11	560592		
1998-12	398078	2002-12	440475		
1999-01	328412	2003-01	521283		
1999-02	354336	2003-02	387136		
1999-03	390436	2003-03	527221		
1999-04	271765	2003-04	496772		
1999-05	375721	2003-05	578660		
1999-06	366840	2003-06	562672		
1999-07	415988	2003-07	613377		
1999-08	369182	2003-08	602379		
1999-09	425050	2003-09	619938		
1999-10	452895	2003-10	693661		
1999-11	420430	2003-11	602119		
1999-12	386572	2003-12	635947		

'Textiles' Import Data (in 000$) D17

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	158079	2000-01	120376	2004-01	252621
1996-02	120716	2000-02	135164	2004-02	250528
1996-03	185901	2000-03	139486	2004-03	302136
1996-04	129878	2000-04	144924	2004-04	288126
1996-05	168902	2000-05	165265	2004-05	316621
1996-06	156673	2000-06	158694	2004-06	329590
1996-07	188067	2000-07	178526	2004-07	362076
1996-08	169283	2000-08	196287	2004-08	337073
1996-09	132142	2000-09	160435	2004-09	340886
1996-10	139209	2000-10	159606	2004-10	313596
1996-11	148467	2000-11	168025	2004-11	331681
1996-12	185128	2000-12	125943	2004-12	361373
1997-01	160665	2001-01	178332	2005-01	256014
1997-02	135644	2001-02	139043	2005-02	299558
1997-03	143249	2001-03	126749	2005-03	358473
1997-04	117766	2001-04	122169	2005-04	352405
1997-05	183183	2001-05	137985	2005-05	337405
1997-06	162134	2001-06	129118	2005-06	328138
1997-07	213657	2001-07	135777	2005-07	332354
1997-08	178477	2001-08	143357	2005-08	345046
1997-09	178909	2001-09	128290	2005-09	352102
1997-10	175518	2001-10	150204	2005-10	340373
1997-11	188682	2001-11	157209	2005-11	325940
1997-12	198752	2001-12	134649	2005-12	346329
1998-01	138337	2002-01	157615	2006-01	244481
1998-02	185921	2002-02	138698	2006-02	332200
1998-03	179701	2002-03	262075	2006-03	348124
1998-04	152608	2002-04	180678	2006-04	305158
1998-05	190594	2002-05	221606	2006-05	333339
1998-06	180146	2002-06	204161		
1998-07	181676	2002-07	238034		
1998-08	174555	2002-08	220106		
1998-09	155670	2002-09	213140		
1998-10	149349	2002-10	204825		
1998-11	160500	2002-11	240972		
1998-12	155212	2002-12	218548		
1999-01	90239	2003-01	221078		
1999-02	124088	2003-02	178959		
1999-03	115528	2003-03	242043		
1999-04	125688	2003-04	230544		
1999-05	136292	2003-05	249999		
1999-06	154904	2003-06	252942		
1999-07	159801	2003-07	303982		
1999-08	140383	2003-08	265595		
1999-09	155745	2003-09	283557		
1999-10	148853	2003-10	296083		
1999-11	152620	2003-11	222557		
1999-12	141666	2003-12	346696		

'Wearing Apparel' Export Data (in 000$) D18

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	380369	2000-01	450543	2004-01	885225
1996-02	377195	2000-02	495485	2004-02	638224
1996-03	468119	2000-03	464341	2004-03	854456
1996-04	431771	2000-04	511425	2004-04	764984
1996-05	280460	2000-05	423539	2004-05	711644
1996-06	386605	2000-06	475189	2004-06	760993
1996-07	409339	2000-07	487629	2004-07	914452
1996-08	454168	2000-08	449241	2004-08	711736
1996-09	379939	2000-09	426118	2004-09	729621
1996-10	388626	2000-10	387911	2004-10	757224
1996-11	423714	2000-11	401958	2004-11	697611
1996-12	449397	2000-12	443762	2004-12	913982
1997-01	458662	2001-01	477732	2005-01	796301
1997-02	423265	2001-02	513594	2005-02	858672
1997-03	501141	2001-03	466110	2005-03	952255
1997-04	436312	2001-04	427555	2005-04	849876
1997-05	447865	2001-05	439414	2005-05	755558
1997-06	440564	2001-06	488191	2005-06	855346
1997-07	478910	2001-07	437970	2005-07	909443
1997-08	517631	2001-08	465673	2005-08	799367
1997-09	446794	2001-09	426885	2005-09	813954
1997-10	409263	2001-10	403133	2005-10	772073
1997-11	453799	2001-11	430545	2005-11	682958
1997-12	427933	2001-12	420706	2005-12	878937
1998-01	496603	2002-01	505899	2006-01	670650
1998-02	439828	2002-02	483127	2006-02	817482
1998-03	568668	2002-03	576358	2006-03	953925
1998-04	411546	2002-04	520205	2006-04	782575
1998-05	525372	2002-05	544197	2006-05	797156
1998-06	480229	2002-06	545553		
1998-07	526312	2002-07	629740		
1998-08	514130	2002-08	596007		
1998-09	419745	2002-09	534348		
1998-10	468665	2002-10	559178		
1998-11	406119	2002-11	589429		
1998-12	458405	2002-12	531192		
1999-01	443684	2003-01	705872		
1999-02	494528	2003-02	549699		
1999-03	532646	2003-03	720752		
1999-04	328626	2003-04	655756		
1999-05	440331	2003-05	720878		
1999-06	411574	2003-06	684455		
1999-07	448273	2003-07	761707		
1999-08	411073	2003-08	702461		
1999-09	441097	2003-09	630152		
1999-10	464700	2003-10	707612		
1999-11	420012	2003-11	615189		
1999-12	433561	2003-12	699363		

'Wearing Apparel' Import Data (in 000$) D18

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	7034	2000-01	9752	2004-01	28371
1996-02	9081	2000-02	16327	2004-02	38224
1996-03	19813	2000-03	20977	2004-03	54813
1996-04	17139	2000-04	23547	2004-04	46819
1996-05	15932	2000-05	20304	2004-05	49081
1996-06	11836	2000-06	15273	2004-06	38315
1996-07	13789	2000-07	16951	2004-07	49488
1996-08	17737	2000-08	25070	2004-08	60145
1996-09	18548	2000-09	33969	2004-09	71694
1996-10	23887	2000-10	39322	2004-10	64671
1996-11	20129	2000-11	28828	2004-11	55841
1996-12	16535	2000-12	16044	2004-12	44096
1997-01	18911	2001-01	17602	2005-01	33866
1997-02	19858	2001-02	21307	2005-02	51454
1997-03	24588	2001-03	22703	2005-03	66122
1997-04	21034	2001-04	21593	2005-04	69768
1997-05	22967	2001-05	20376	2005-05	45823
1997-06	15607	2001-06	20605	2005-06	42960
1997-07	14954	2001-07	22140	2005-07	51160
1997-08	21780	2001-08	28974	2005-08	66689
1997-09	29319	2001-09	27807	2005-09	84870
1997-10	38097	2001-10	32603	2005-10	78307
1997-11	27325	2001-11	26073	2005-11	57659
1997-12	22016	2001-12	15278	2005-12	44966
1998-01	10934	2002-01	12225	2006-01	38500
1998-02	18488	2002-02	16286	2006-02	74608
1998-03	28189	2002-03	26298	2006-03	96627
1998-04	29594	2002-04	24854	2006-04	77210
1998-05	19738	2002-05	26271	2006-05	71029
1998-06	17845	2002-06	26270		
1998-07	17229	2002-07	32752		
1998-08	21233	2002-08	39625		
1998-09	27815	2002-09	41058		
1998-10	24719	2002-10	40850		
1998-11	19729	2002-11	36271		
1998-12	13074	2002-12	23255		
1999-01	7125	2003-01	19733		
1999-02	10829	2003-02	27555		
1999-03	15343	2003-03	32234		
1999-04	17236	2003-04	35047		
1999-05	13943	2003-05	35757		
1999-06	9948	2003-06	31743		
1999-07	13475	2003-07	41009		
1999-08	16284	2003-08	42574		
1999-09	24457	2003-09	56523		
1999-10	24612	2003-10	55833		
1999-11	18488	2003-11	34405		
1999-12	13923	2003-12	37574		

'Luggage, Saddlery and Footwear' Export Data (in 000$) D19

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	12066	2000-01	9632	2004-01	25223
1996-02	13505	2000-02	17022	2004-02	22838
1996-03	16839	2000-03	14947	2004-03	36782
1996-04	21560	2000-04	19953	2004-04	33220
1996-05	16921	2000-05	24039	2004-05	26804
1996-06	16803	2000-06	18532	2004-06	25652
1996-07	15355	2000-07	14868	2004-07	24464
1996-08	21357	2000-08	13767	2004-08	25517
1996-09	18152	2000-09	14995	2004-09	29318
1996-10	22688	2000-10	13703	2004-10	29839
1996-11	26525	2000-11	15750	2004-11	22240
1996-12	19103	2000-12	12309	2004-12	26063
1997-01	17672	2001-01	12955	2005-01	20966
1997-02	15900	2001-02	16876	2005-02	28539
1997-03	25846	2001-03	18559	2005-03	33856
1997-04	22423	2001-04	20440	2005-04	33456
1997-05	31908	2001-05	25130	2005-05	31078
1997-06	27919	2001-06	18038	2005-06	29500
1997-07	24349	2001-07	15526	2005-07	30729
1997-08	22900	2001-08	17194	2005-08	32941
1997-09	30105	2001-09	18169	2005-09	39386
1997-10	32220	2001-10	18031	2005-10	34092
1997-11	31134	2001-11	19355	2005-11	26527
1997-12	16793	2001-12	11514	2005-12	29121
1998-01	25727	2002-01	13511	2006-01	21048
1998-02	22601	2002-02	14472	2006-02	30991
1998-03	28142	2002-03	18819	2006-03	42926
1998-04	20537	2002-04	19073	2006-04	33428
1998-05	36481	2002-05	20981	2006-05	36034
1998-06	23315	2002-06	18231		
1998-07	21970	2002-07	17375		
1998-08	20869	2002-08	18584		
1998-09	16806	2002-09	18471		
1998-10	25100	2002-10	19850		
1998-11	18152	2002-11	21218		
1998-12	11796	2002-12	13604		
1999-01	10086	2003-01	20354		
1999-02	11731	2003-02	17690		
1999-03	17634	2003-03	25762		
1999-04	16064	2003-04	25840		
1999-05	20701	2003-05	31837		
1999-06	16373	2003-06	25636		
1999-07	12367	2003-07	23704		
1999-08	13208	2003-08	23303		
1999-09	16817	2003-09	25645		
1999-10	17189	2003-10	26948		
1999-11	15986	2003-11	19988		
1999-12	12737	2003-12	19129		

'Luggage, Saddlery and Footwear' Import Data (in 000$) D19

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	19546	2000-01	14307	2004-01	27878
1996-02	22705	2000-02	23622	2004-02	47501
1996-03	40443	2000-03	34469	2004-03	68864
1996-04	33710	2000-04	28912	2004-04	64593
1996-05	34650	2000-05	29324	2004-05	57127
1996-06	25781	2000-06	25712	2004-06	38788
1996-07	31216	2000-07	20925	2004-07	40395
1996-08	30358	2000-08	28396	2004-08	54127
1996-09	28861	2000-09	30091	2004-09	68156
1996-10	30148	2000-10	33948	2004-10	59729
1996-11	29444	2000-11	24282	2004-11	48729
1996-12	21464	2000-12	18253	2004-12	42685
1997-01	24922	2001-01	20700	2005-01	37938
1997-02	27800	2001-02	25891	2005-02	72382
1997-03	38686	2001-03	27438	2005-03	108330
1997-04	32251	2001-04	26806	2005-04	82889
1997-05	32182	2001-05	28234	2005-05	60857
1997-06	24735	2001-06	19667	2005-06	52710
1997-07	23600	2001-07	18512	2005-07	53637
1997-08	27313	2001-08	20341	2005-08	96426
1997-09	30056	2001-09	20219	2005-09	90886
1997-10	38057	2001-10	25705	2005-10	75791
1997-11	32751	2001-11	18281	2005-11	47816
1997-12	26340	2001-12	17502	2005-12	59408
1998-01	17807	2002-01	17923	2006-01	51714
1998-02	32778	2002-02	27235	2006-02	112708
1998-03	40001	2002-03	35691	2006-03	130022
1998-04	29989	2002-04	28499	2006-04	87420
1998-05	29290	2002-05	29281	2006-05	75614
1998-06	24351	2002-06	22420		
1998-07	23037	2002-07	24605		
1998-08	26118	2002-08	31039		
1998-09	23165	2002-09	30658		
1998-10	25583	2002-10	33609		
1998-11	17957	2002-11	26137		
1998-12	16426	2002-12	24394		
1999-01	8001	2003-01	28150		
1999-02	14171	2003-02	36593		
1999-03	23051	2003-03	47050		
1999-04	20000	2003-04	47434		
1999-05	16614	2003-05	34429		
1999-06	14942	2003-06	27173		
1999-07	15290	2003-07	29341		
1999-08	16409	2003-08	37990		
1999-09	21088	2003-09	44403		
1999-10	20719	2003-10	46737		
1999-11	18987	2003-11	25909		
1999-12	16129	2003-12	31694		

'Products of Wood and Cork' Export Data (in 000$) D20

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	6113	2000-01	3981	2004-01	14509
1996-02	3413	2000-02	6135	2004-02	14663
1996-03	5887	2000-03	4851	2004-03	16067
1996-04	6607	2000-04	6086	2004-04	15100
1996-05	6976	2000-05	5623	2004-05	17432
1996-06	5272	2000-06	4959	2004-06	16143
1996-07	7121	2000-07	5212	2004-07	16683
1996-08	4122	2000-08	5226	2004-08	17346
1996-09	6096	2000-09	4257	2004-09	17334
1996-10	4117	2000-10	5456	2004-10	17056
1996-11	6042	2000-11	5290	2004-11	17654
1996-12	6771	2000-12	5974	2004-12	23740
1997-01	5542	2001-01	5259	2005-01	17598
1997-02	5219	2001-02	6913	2005-02	20011
1997-03	5279	2001-03	6840	2005-03	22541
1997-04	5850	2001-04	7323	2005-04	21842
1997-05	8313	2001-05	9700	2005-05	26165
1997-06	5405	2001-06	8203	2005-06	18655
1997-07	8782	2001-07	9460	2005-07	17697
1997-08	6047	2001-08	12300	2005-08	22113
1997-09	8125	2001-09	12132	2005-09	20002
1997-10	5728	2001-10	10588	2005-10	19645
1997-11	6216	2001-11	11571	2005-11	19857
1997-12	4599	2001-12	9113	2005-12	23644
1998-01	6909	2002-01	11544	2006-01	16312
1998-02	9087	2002-02	6568	2006-02	22965
1998-03	5995	2002-03	9511	2006-03	21270
1998-04	3310	2002-04	9688	2006-04	20272
1998-05	7339	2002-05	9851	2006-05	21271
1998-06	6980	2002-06	9467		
1998-07	4923	2002-07	11477		
1998-08	9624	2002-08	9269		
1998-09	3491	2002-09	9560		
1998-10	4509	2002-10	9921		
1998-11	4212	2002-11	11387		
1998-12	4636	2002-12	10236		
1999-01	4377	2003-01	12770		
1999-02	4598	2003-02	9449		
1999-03	5188	2003-03	11834		
1999-04	3952	2003-04	11975		
1999-05	7502	2003-05	11202		
1999-06	7767	2003-06	11499		
1999-07	5997	2003-07	12411		
1999-08	4471	2003-08	12337		
1999-09	6715	2003-09	12689		
1999-10	5054	2003-10	14318		
1999-11	8323	2003-11	11480		
1999-12	4552	2003-12	14019		

'Products of Wood and Cork' Import Data (in 000$) D20

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	10227	2000-01	14398	2004-01	21083
1996-02	7381	2000-02	11594	2004-02	19962
1996-03	7624	2000-03	13304	2004-03	26945
1996-04	11721	2000-04	12676	2004-04	30021
1996-05	14993	2000-05	15726	2004-05	31316
1996-06	9917	2000-06	15844	2004-06	37722
1996-07	11069	2000-07	20638	2004-07	41490
1996-08	9364	2000-08	23017	2004-08	38301
1996-09	7529	2000-09	20213	2004-09	40784
1996-10	12859	2000-10	19151	2004-10	36752
1996-11	11454	2000-11	21263	2004-11	38649
1996-12	10727	2000-12	19543	2004-12	36350
1997-01	7684	2001-01	16310	2005-01	32559
1997-02	9636	2001-02	13501	2005-02	34192
1997-03	8214	2001-03	9288	2005-03	45155
1997-04	10192	2001-04	8136	2005-04	51695
1997-05	11906	2001-05	8551	2005-05	54708
1997-06	14736	2001-06	8307	2005-06	57020
1997-07	16205	2001-07	9092	2005-07	52493
1997-08	12412	2001-08	7845	2005-08	58655
1997-09	11883	2001-09	6227	2005-09	54900
1997-10	11440	2001-10	7988	2005-10	59537
1997-11	11791	2001-11	5937	2005-11	39706
1997-12	14268	2001-12	5142	2005-12	46870
1998-01	7333	2002-01	6010	2006-01	34449
1998-02	13125	2002-02	4812	2006-02	44422
1998-03	13928	2002-03	9700	2006-03	50742
1998-04	14366	2002-04	12733	2006-04	64352
1998-05	11706	2002-05	14024	2006-05	69412
1998-06	16314	2002-06	16818		
1998-07	15959	2002-07	19114		
1998-08	14393	2002-08	14938		
1998-09	14590	2002-09	12532		
1998-10	12589	2002-10	13166		
1998-11	16535	2002-11	14840		
1998-12	13401	2002-12	14220		
1999-01	7905	2003-01	13217		
1999-02	7712	2003-02	12324		
1999-03	9441	2003-03	15375		
1999-04	10034	2003-04	17228		
1999-05	10715	2003-05	18071		
1999-06	14014	2003-06	22824		
1999-07	12380	2003-07	26051		
1999-08	11601	2003-08	25768		
1999-09	12929	2003-09	21679		
1999-10	11126	2003-10	27941		
1999-11	12206	2003-11	17102		
1999-12	12344	2003-12	23021		

'Paper and Paper Products' Export Data (in 000$) D21

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	6643	2000-01	9752	2004-01	35735
1996-02	8691	2000-02	12008	2004-02	30210
1996-03	12157	2000-03	12193	2004-03	39211
1996-04	8249	2000-04	13563	2004-04	36581
1996-05	11192	2000-05	13198	2004-05	35025
1996-06	9512	2000-06	15101	2004-06	35526
1996-07	13137	2000-07	14851	2004-07	39029
1996-08	11692	2000-08	13928	2004-08	38441
1996-09	9047	2000-09	13949	2004-09	43659
1996-10	11485	2000-10	15525	2004-10	37491
1996-11	12128	2000-11	13645	2004-11	40946
1996-12	11734	2000-12	16580	2004-12	45587
1997-01	9737	2001-01	13447	2005-01	37640
1997-02	11132	2001-02	16462	2005-02	41625
1997-03	12573	2001-03	16640	2005-03	48195
1997-04	11111	2001-04	12901	2005-04	47746
1997-05	16828	2001-05	20952	2005-05	46093
1997-06	12240	2001-06	22574	2005-06	50610
1997-07	13341	2001-07	20719	2005-07	43556
1997-08	13864	2001-08	22522	2005-08	45828
1997-09	16209	2001-09	19939	2005-09	51926
1997-10	10665	2001-10	23256	2005-10	46988
1997-11	13749	2001-11	26989	2005-11	46918
1997-12	12714	2001-12	25327	2005-12	52043
1998-01	12738	2002-01	25821	2006-01	35931
1998-02	13299	2002-02	19202	2006-02	48093
1998-03	14532	2002-03	24109	2006-03	50615
1998-04	14323	2002-04	22999	2006-04	40661
1998-05	12702	2002-05	25829	2006-05	47348
1998-06	13462	2002-06	21248		
1998-07	10862	2002-07	26479		
1998-08	12090	2002-08	24636		
1998-09	10308	2002-09	27498		
1998-10	11432	2002-10	27626		
1998-11	13353	2002-11	28750		
1998-12	10917	2002-12	28377		
1999-01	8250	2003-01	27636		
1999-02	11237	2003-02	22523		
1999-03	13824	2003-03	32579		
1999-04	10098	2003-04	26821		
1999-05	11358	2003-05	29206		
1999-06	11849	2003-06	28401		
1999-07	12919	2003-07	35727		
1999-08	9988	2003-08	29452		
1999-09	14805	2003-09	32424		
1999-10	15036	2003-10	35610		
1999-11	13816	2003-11	28441		
1999-12	15494	2003-12	38389		

'Paper and Paper Products' Import Data (in 000$) D21

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	76684	2000-01	70570	2004-01	116943
1996-02	62239	2000-02	84430	2004-02	107509
1996-03	73025	2000-03	80804	2004-03	140125
1996-04	70476	2000-04	93942	2004-04	129505
1996-05	72932	2000-05	110328	2004-05	135736
1996-06	63601	2000-06	103260	2004-06	157388
1996-07	71658	2000-07	101942	2004-07	157169
1996-08	65827	2000-08	114885	2004-08	143234
1996-09	63773	2000-09	109408	2004-09	156477
1996-10	61660	2000-10	96578	2004-10	139997
1996-11	83019	2000-11	100812	2004-11	155029
1996-12	71649	2000-12	84644	2004-12	173085
1997-01	60848	2001-01	104781	2005-01	135948
1997-02	67956	2001-02	61627	2005-02	160855
1997-03	65406	2001-03	51603	2005-03	181879
1997-04	56161	2001-04	49056	2005-04	166405
1997-05	81968	2001-05	61729	2005-05	179938
1997-06	66607	2001-06	65840	2005-06	179166
1997-07	76997	2001-07	68278	2005-07	157974
1997-08	68842	2001-08	69413	2005-08	170900
1997-09	71649	2001-09	66131	2005-09	168088
1997-10	60921	2001-10	61131	2005-10	158498
1997-11	71749	2001-11	66237	2005-11	165544
1997-12	87622	2001-12	58825	2005-12	184663
1998-01	62133	2002-01	62191	2006-01	148685
1998-02	79158	2002-02	58471	2006-02	173664
1998-03	77432	2002-03	72089	2006-03	194305
1998-04	68431	2002-04	86325	2006-04	178256
1998-05	81660	2002-05	90523	2006-05	190716
1998-06	66890	2002-06	82557		
1998-07	76897	2002-07	100023		
1998-08	67201	2002-08	88783		
1998-09	66891	2002-09	87709		
1998-10	83468	2002-10	92746		
1998-11	69998	2002-11	98921		
1998-12	60120	2002-12	87148		
1999-01	54914	2003-01	89190		
1999-02	57446	2003-02	75693		
1999-03	71778	2003-03	104578		
1999-04	75364	2003-04	96768		
1999-05	83344	2003-05	108472		
1999-06	74634	2003-06	117998		
1999-07	75679	2003-07	131041		
1999-08	69106	2003-08	114664		
1999-09	84789	2003-09	121520		
1999-10	75923	2003-10	132505		
1999-11	85124	2003-11	92926		
1999-12	89665	2003-12	133309		

'Printing and publishing' Export Data (in 000$) D22

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	10347	2000-01	3376	2004-01	4769
1996-02	2104	2000-02	2695	2004-02	3560
1996-03	3077	2000-03	2882	2004-03	4841
1996-04	5434	2000-04	3156	2004-04	5695
1996-05	3521	2000-05	3329	2004-05	5631
1996-06	2824	2000-06	3148	2004-06	6738
1996-07	2740	2000-07	3287	2004-07	8675
1996-08	5701	2000-08	4718	2004-08	8766
1996-09	3460	2000-09	5492	2004-09	9095
1996-10	3099	2000-10	3977	2004-10	7247
1996-11	2534	2000-11	3101	2004-11	5295
1996-12	2885	2000-12	3483	2004-12	11834
1997-01	4517	2001-01	2513	2005-01	5397
1997-02	6803	2001-02	3307	2005-02	7072
1997-03	2151	2001-03	5230	2005-03	6727
1997-04	2631	2001-04	2412	2005-04	6678
1997-05	2368	2001-05	3453	2005-05	8226
1997-06	2316	2001-06	3562	2005-06	10310
1997-07	4622	2001-07	3342	2005-07	9899
1997-08	2831	2001-08	4682	2005-08	10969
1997-09	2721	2001-09	3747	2005-09	16538
1997-10	3017	2001-10	3847	2005-10	7447
1997-11	2946	2001-11	3748	2005-11	7152
1997-12	3189	2001-12	2896	2005-12	8633
1998-01	3774	2002-01	2396	2006-01	4726
1998-02	3349	2002-02	2624	2006-02	6965
1998-03	4343	2002-03	3400	2006-03	7131
1998-04	4597	2002-04	3595	2006-04	6378
1998-05	2877	2002-05	3869	2006-05	7051
1998-06	3156	2002-06	3665		
1998-07	3019	2002-07	6349		
1998-08	3862	2002-08	5871		
1998-09	5322	2002-09	4893		
1998-10	2241	2002-10	3806		
1998-11	1636	2002-11	3773		
1998-12	2643	2002-12	4495		
1999-01	9495	2003-01	3561		
1999-02	2957	2003-02	3641		
1999-03	2593	2003-03	3584		
1999-04	3037	2003-04	3464		
1999-05	2870	2003-05	5701		
1999-06	2648	2003-06	6015		
1999-07	2254	2003-07	5985		
1999-08	5473	2003-08	7243		
1999-09	4996	2003-09	7710		
1999-10	3962	2003-10	8547		
1999-11	3587	2003-11	4529		
1999-12	3750	2003-12	7010		

'Printing and publishing' Import Data (in 000$) D22

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	8214	2000-01	12554	2004-01	13455
1996-02	5647	2000-02	15187	2004-02	16835
1996-03	9343	2000-03	16151	2004-03	17009
1996-04	9032	2000-04	20857	2004-04	23691
1996-05	11048	2000-05	27976	2004-05	15840
1996-06	10380	2000-06	22731	2004-06	18067
1996-07	13444	2000-07	26179	2004-07	20981
1996-08	11663	2000-08	25437	2004-08	29109
1996-09	11078	2000-09	21421	2004-09	21422
1996-10	13647	2000-10	19979	2004-10	38622
1996-11	13362	2000-11	20862	2004-11	30721
1996-12	16186	2000-12	21453	2004-12	36489
1997-01	9688	2001-01	12469	2005-01	47467
1997-02	7659	2001-02	13783	2005-02	24130
1997-03	9534	2001-03	8935	2005-03	55233
1997-04	12298	2001-04	58439	2005-04	28645
1997-05	12063	2001-05	10350	2005-05	24645
1997-06	10734	2001-06	12387	2005-06	24882
1997-07	14604	2001-07	24707	2005-07	25064
1997-08	16380	2001-08	13592	2005-08	23947
1997-09	15715	2001-09	12130	2005-09	31119
1997-10	15606	2001-10	19637	2005-10	29543
1997-11	14588	2001-11	15919	2005-11	26105
1997-12	18944	2001-12	17217	2005-12	64230
1998-01	9752	2002-01	13201	2006-01	23103
1998-02	12825	2002-02	6735	2006-02	24103
1998-03	12250	2002-03	11132	2006-03	22857
1998-04	11090	2002-04	18606	2006-04	27681
1998-05	11652	2002-05	13727	2006-05	23503
1998-06	16112	2002-06	11074		
1998-07	14685	2002-07	24866		
1998-08	13695	2002-08	15229		
1998-09	16810	2002-09	18421		
1998-10	11520	2002-10	21238		
1998-11	13440	2002-11	24664		
1998-12	15525	2002-12	20872		
1999-01	7775	2003-01	36247		
1999-02	12101	2003-02	14668		
1999-03	10271	2003-03	20322		
1999-04	10849	2003-04	12960		
1999-05	10714	2003-05	19063		
1999-06	12706	2003-06	19140		
1999-07	11724	2003-07	17379		
1999-08	12721	2003-08	20002		
1999-09	17481	2003-09	20411		
1999-10	12892	2003-10	19799		
1999-11	16990	2003-11	19614		
1999-12	20171	2003-12	30965		

'Coke, Petroleum Products and Nuclear Fuel' Export Data (in 000$) D23

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	32342	2000-01	26625	2004-01	81029
1996-02	30283	2000-02	36290	2004-02	66877
1996-03	13943	2000-03	35377	2004-03	137367
1996-04	18909	2000-04	12445	2004-04	64388
1996-05	24774	2000-05	40821	2004-05	132624
1996-06	38391	2000-06	14342	2004-06	164794
1996-07	55936	2000-07	3454	2004-07	137479
1996-08	14449	2000-08	15454	2004-08	109117
1996-09	11582	2000-09	13359	2004-09	97030
1996-10	9536	2000-10	21293	2004-10	72122
1996-11	4625	2000-11	35569	2004-11	136335
1996-12	4430	2000-12	45687	2004-12	165186
1997-01	11925	2001-01	25884	2005-01	200532
1997-02	28398	2001-02	26579	2005-02	157496
1997-03	25943	2001-03	30547	2005-03	196072
1997-04	25553	2001-04	49019	2005-04	231590
1997-05	7316	2001-05	49837	2005-05	127811
1997-06	11342	2001-06	32655	2005-06	202083
1997-07	18031	2001-07	27522	2005-07	197060
1997-08	13560	2001-08	24936	2005-08	225901
1997-09	11696	2001-09	19312	2005-09	242874
1997-10	6292	2001-10	16412	2005-10	272312
1997-11	9158	2001-11	50146	2005-11	154879
1997-12	9845	2001-12	63571	2005-12	310334
1998-01	6644	2002-01	41499	2006-01	294115
1998-02	11755	2002-02	33583	2006-02	120026
1998-03	10569	2002-03	49947	2006-03	269811
1998-04	18736	2002-04	65065	2006-04	274798
1998-05	31475	2002-05	74321	2006-05	227349
1998-06	33628	2002-06	54162		
1998-07	24384	2002-07	53192		
1998-08	13191	2002-08	38317		
1998-09	25956	2002-09	63286		
1998-10	22326	2002-10	51717		
1998-11	23294	2002-11	62049		
1998-12	18668	2002-12	82988		
1999-01	24047	2003-01	48636		
1999-02	18452	2003-02	124726		
1999-03	36631	2003-03	77093		
1999-04	33301	2003-04	53543		
1999-05	28823	2003-05	70144		
1999-06	28363	2003-06	87096		
1999-07	41482	2003-07	91230		
1999-08	40435	2003-08	82944		
1999-09	11522	2003-09	80819		
1999-10	12593	2003-10	68471		
1999-11	17481	2003-11	58599		
1999-12	22065	2003-12	110244		

'Coke, Petroleum Products and Nuclear Fuel' Import Data (in 000$) D23

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	42434	2000-01	92166	2004-01	184808
1996-02	30039	2000-02	181831	2004-02	218908
1996-03	72683	2000-03	211490	2004-03	246074
1996-04	84801	2000-04	211204	2004-04	189738
1996-05	84673	2000-05	165837	2004-05	278460
1996-06	47503	2000-06	206965	2004-06	233139
1996-07	62628	2000-07	202465	2004-07	342807
1996-08	90929	2000-08	257833	2004-08	374036
1996-09	91709	2000-09	264943	2004-09	407239
1996-10	125772	2000-10	312046	2004-10	438303
1996-11	114583	2000-11	228045	2004-11	313550
1996-12	221559	2000-12	252272	2004-12	569722
1997-01	140441	2001-01	231599	2005-01	249981
1997-02	75243	2001-02	225000	2005-02	298391
1997-03	108250	2001-03	181414	2005-03	409038
1997-04	91657	2001-04	113103	2005-04	432407
1997-05	74835	2001-05	120773	2005-05	425378
1997-06	68697	2001-06	73665	2005-06	472896
1997-07	63132	2001-07	114016	2005-07	413271
1997-08	83739	2001-08	84683	2005-08	566478
1997-09	104992	2001-09	130608	2005-09	595742
1997-10	97071	2001-10	137332	2005-10	517714
1997-11	98072	2001-11	173790	2005-11	507405
1997-12	146158	2001-12	212736	2005-12	617794
1998-01	85732	2002-01	108069	2006-01	459661
1998-02	128706	2002-02	151438	2006-02	511489
1998-03	110773	2002-03	169325	2006-03	614135
1998-04	74152	2002-04	136938	2006-04	730928
1998-05	44592	2002-05	143145	2006-05	579462
1998-06	90268	2002-06	107477		
1998-07	52829	2002-07	154248		
1998-08	78616	2002-08	165457		
1998-09	62948	2002-09	210407		
1998-10	87362	2002-10	303346		
1998-11	46160	2002-11	255471		
1998-12	104673	2002-12	286004		
1999-01	49614	2003-01	182773		
1999-02	100035	2003-02	194032		
1999-03	46451	2003-03	287645		
1999-04	61245	2003-04	193261		
1999-05	74900	2003-05	213931		
1999-06	74138	2003-06	216933		
1999-07	73419	2003-07	218328		
1999-08	97453	2003-08	230765		
1999-09	167278	2003-09	292856		
1999-10	166545	2003-10	296167		
1999-11	198167	2003-11	188762		
1999-12	175048	2003-12	317242		

'Chemicals and Chemical Products' Export Data (in 000$) D24

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	89705	2000-01	95776	2004-01	188457
1996-02	99568	2000-02	111141	2004-02	157606
1996-03	108787	2000-03	133645	2004-03	213722
1996-04	104476	2000-04	127364	2004-04	201031
1996-05	95823	2000-05	116544	2004-05	199283
1996-06	99422	2000-06	120765	2004-06	211889
1996-07	105148	2000-07	118062	2004-07	227683
1996-08	106421	2000-08	103511	2004-08	209319
1996-09	104734	2000-09	128756	2004-09	224389
1996-10	109424	2000-10	119525	2004-10	250842
1996-11	104754	2000-11	111146	2004-11	222695
1996-12	116028	2000-12	111255	2004-12	249495
1997-01	90010	2001-01	101740	2005-01	191426
1997-02	94860	2001-02	125024	2005-02	201855
1997-03	115607	2001-03	129529	2005-03	249660
1997-04	106915	2001-04	124392	2005-04	228399
1997-05	125919	2001-05	148700	2005-05	246359
1997-06	127103	2001-06	107249	2005-06	248851
1997-07	120262	2001-07	110962	2005-07	226970
1997-08	127338	2001-08	120917	2005-08	235223
1997-09	115732	2001-09	117235	2005-09	270311
1997-10	115321	2001-10	146024	2005-10	239357
1997-11	118797	2001-11	133532	2005-11	225920
1997-12	104645	2001-12	115200	2005-12	253978
1998-01	100064	2002-01	117455	2006-01	190035
1998-02	115510	2002-02	100980	2006-02	251286
1998-03	123986	2002-03	131741	2006-03	282067
1998-04	106716	2002-04	140034	2006-04	265346
1998-05	122746	2002-05	137018	2006-05	300865
1998-06	114374	2002-06	114698		
1998-07	113729	2002-07	140035		
1998-08	121155	2002-08	139474		
1998-09	87736	2002-09	143531		
1998-10	100036	2002-10	136721		
1998-11	92549	2002-11	140033		
1998-12	78869	2002-12	138954		
1999-01	79883	2003-01	142878		
1999-02	104670	2003-02	138598		
1999-03	100402	2003-03	172158		
1999-04	94757	2003-04	150441		
1999-05	112934	2003-05	161949		
1999-06	106865	2003-06	147577		
1999-07	102560	2003-07	171543		
1999-08	91721	2003-08	165520		
1999-09	105969	2003-09	173010		
1999-10	112941	2003-10	176613		
1999-11	116274	2003-11	145461		
1999-12	105802	2003-12	180594		

'Chemicals and Chemical Products' Import Data (in 000$) D24

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	510508	2000-01	541312	2004-01	1090821
1996-02	412381	2000-02	641379	2004-02	1033368
1996-03	670085	2000-03	689803	2004-03	1262238
1996-04	511141	2000-04	677619	2004-04	1206288
1996-05	570136	2000-05	738899	2004-05	1209058
1996-06	535679	2000-06	734884	2004-06	1243310
1996-07	538093	2000-07	653011	2004-07	1311797
1996-08	504754	2000-08	725823	2004-08	1233537
1996-09	509795	2000-09	727541	2004-09	1391567
1996-10	535563	2000-10	719060	2004-10	1290105
1996-11	549443	2000-11	706637	2004-11	1363011
1996-12	550249	2000-12	527712	2004-12	1499260
1997-01	525100	2001-01	642195	2005-01	1211527
1997-02	493071	2001-02	569275	2005-02	1372551
1997-03	594921	2001-03	493576	2005-03	1628958
1997-04	526129	2001-04	523603	2005-04	1504508
1997-05	622184	2001-05	592611	2005-05	1521504
1997-06	562064	2001-06	538195	2005-06	1554885
1997-07	623172	2001-07	530061	2005-07	1398395
1997-08	598534	2001-08	608953	2005-08	1417563
1997-09	670038	2001-09	586782	2005-09	1570773
1997-10	666052	2001-10	590008	2005-10	1424518
1997-11	623928	2001-11	570478	2005-11	1387101
1997-12	646572	2001-12	529536	2005-12	1484968
1998-01	477243	2002-01	592300	2006-01	1186934
1998-02	667487	2002-02	539998	2006-02	1492931
1998-03	700069	2002-03	712994	2006-03	1722298
1998-04	589488	2002-04	730856	2006-04	1556595
1998-05	656557	2002-05	793275	2006-05	1670726
1998-06	659548	2002-06	706436		
1998-07	623964	2002-07	761683		
1998-08	570885	2002-08	711753		
1998-09	600349	2002-09	803070		
1998-10	594555	2002-10	775615		
1998-11	550283	2002-11	812011		
1998-12	506700	2002-12	720586		
1999-01	351563	2003-01	844765		
1999-02	499625	2003-02	732755		
1999-03	539726	2003-03	912651		
1999-04	601425	2003-04	906531		
1999-05	598571	2003-05	948310		
1999-06	621676	2003-06	945901		
1999-07	589199	2003-07	996567		
1999-08	514955	2003-08	945338		
1999-09	632302	2003-09	1016848		
1999-10	604092	2003-10	1037048		
1999-11	649852	2003-11	786931		
1999-12	643347	2003-12	1164386		

'Rubber and Plastic Products' Export Data (in 000$) D25

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	37091	2000-01	47080	2004-01	139769
1996-02	39820	2000-02	62456	2004-02	117518
1996-03	52067	2000-03	62225	2004-03	160613
1996-04	39094	2000-04	69218	2004-04	164907
1996-05	39476	2000-05	56975	2004-05	149829
1996-06	40130	2000-06	66440	2004-06	166108
1996-07	44689	2000-07	72058	2004-07	164585
1996-08	44744	2000-08	65803	2004-08	162385
1996-09	42598	2000-09	71272	2004-09	176742
1996-10	43740	2000-10	70706	2004-10	180330
1996-11	40349	2000-11	69893	2004-11	176286
1996-12	46420	2000-12	67325	2004-12	199801
1997-01	42096	2001-01	63728	2005-01	141394
1997-02	43256	2001-02	74502	2005-02	178438
1997-03	51893	2001-03	73267	2005-03	213873
1997-04	53597	2001-04	73573	2005-04	213774
1997-05	56402	2001-05	85359	2005-05	216946
1997-06	54563	2001-06	77888	2005-06	217034
1997-07	54171	2001-07	71999	2005-07	220994
1997-08	51690	2001-08	86769	2005-08	218027
1997-09	55581	2001-09	81715	2005-09	236716
1997-10	55386	2001-10	87173	2005-10	214845
1997-11	54467	2001-11	91885	2005-11	199866
1997-12	48130	2001-12	72662	2005-12	213811
1998-01	50195	2002-01	71166	2006-01	153387
1998-02	51852	2002-02	68970	2006-02	218570
1998-03	63617	2002-03	84153	2006-03	248789
1998-04	53682	2002-04	78766	2006-04	215960
1998-05	63335	2002-05	86180	2006-05	243743
1998-06	59271	2002-06	84848		
1998-07	59347	2002-07	100479		
1998-08	61514	2002-08	100396		
1998-09	54908	2002-09	99518		
1998-10	60861	2002-10	105024		
1998-11	52351	2002-11	110753		
1998-12	54506	2002-12	94276		
1999-01	44515	2003-01	104705		
1999-02	56054	2003-02	85421		
1999-03	64331	2003-03	114332		
1999-04	53324	2003-04	120079		
1999-05	62422	2003-05	129468		
1999-06	61966	2003-06	124037		
1999-07	54093	2003-07	130710		
1999-08	46198	2003-08	125365		
1999-09	55625	2003-09	129741		
1999-10	56952	2003-10	142278		
1999-11	57281	2003-11	118158		
1999-12	55092	2003-12	140087		

'Rubber and Plastic Products' Import Data (in 000$) D25

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	54699	2000-01	63498	2004-01	124263
1996-02	42963	2000-02	75373	2004-02	120146
1996-03	68671	2000-03	79984	2004-03	165599
1996-04	53253	2000-04	84591	2004-04	170015
1996-05	70573	2000-05	93461	2004-05	161390
1996-06	69784	2000-06	98331	2004-06	179491
1996-07	82441	2000-07	96628	2004-07	178592
1996-08	73887	2000-08	101975	2004-08	153002
1996-09	69492	2000-09	86074	2004-09	176812
1996-10	76033	2000-10	91710	2004-10	156816
1996-11	81237	2000-11	95510	2004-11	171965
1996-12	77294	2000-12	71494	2004-12	182955
1997-01	58260	2001-01	85824	2005-01	136593
1997-02	51856	2001-02	66600	2005-02	151445
1997-03	70474	2001-03	74816	2005-03	186347
1997-04	60202	2001-04	60413	2005-04	177564
1997-05	82121	2001-05	62042	2005-05	192616
1997-06	71609	2001-06	58980	2005-06	193987
1997-07	84022	2001-07	64062	2005-07	177152
1997-08	75213	2001-08	67910	2005-08	181843
1997-09	82203	2001-09	64405	2005-09	192060
1997-10	77510	2001-10	71263	2005-10	183701
1997-11	86610	2001-11	74664	2005-11	182759
1997-12	88662	2001-12	62118	2005-12	184253
1998-01	55966	2002-01	67516	2006-01	144265
1998-02	82872	2002-02	57721	2006-02	189415
1998-03	97932	2002-03	74869	2006-03	218544
1998-04	86677	2002-04	81410	2006-04	200156
1998-05	88557	2002-05	95378	2006-05	240876
1998-06	96335	2002-06	91067		
1998-07	87359	2002-07	111026		
1998-08	76137	2002-08	87355		
1998-09	74432	2002-09	89691		
1998-10	78530	2002-10	100871		
1998-11	80140	2002-11	114504		
1998-12	79778	2002-12	102309		
1999-01	48330	2003-01	105126		
1999-02	67426	2003-02	83778		
1999-03	76031	2003-03	106762		
1999-04	74633	2003-04	112840		
1999-05	78370	2003-05	113857		
1999-06	82066	2003-06	119092		
1999-07	73718	2003-07	133319		
1999-08	64914	2003-08	116503		
1999-09	78192	2003-09	127815		
1999-10	79425	2003-10	138307		
1999-11	85372	2003-11	110293		
1999-12	83557	2003-12	165854		

'Other Non-metallic Minerals' Export Data (in 000$) D26

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	57349	2000-01	76182	2004-01	160488
1996-02	56695	2000-02	90693	2004-02	138668
1996-03	64907	2000-03	93567	2004-03	199638
1996-04	62015	2000-04	105283	2004-04	201160
1996-05	61979	2000-05	97930	2004-05	198151
1996-06	66256	2000-06	98934	2004-06	208856
1996-07	72046	2000-07	96227	2004-07	204316
1996-08	69489	2000-08	93642	2004-08	182319
1996-09	64567	2000-09	91577	2004-09	209460
1996-10	71507	2000-10	92543	2004-10	203419
1996-11	63114	2000-11	82447	2004-11	194588
1996-12	70985	2000-12	102197	2004-12	216087
1997-01	71714	2001-01	77519	2005-01	173127
1997-02	58886	2001-02	91037	2005-02	199400
1997-03	68992	2001-03	96871	2005-03	240288
1997-04	67150	2001-04	114965	2005-04	231632
1997-05	78531	2001-05	122787	2005-05	238453
1997-06	86396	2001-06	93709	2005-06	231372
1997-07	82314	2001-07	115131	2005-07	226121
1997-08	85979	2001-08	115965	2005-08	239872
1997-09	82369	2001-09	95535	2005-09	253883
1997-10	87823	2001-10	107613	2005-10	227999
1997-11	86989	2001-11	105844	2005-11	195095
1997-12	74801	2001-12	94285	2005-12	229584
1998-01	68159	2002-01	106211	2006-01	148829
1998-02	69387	2002-02	100894	2006-02	213947
1998-03	86196	2002-03	123462	2006-03	249840
1998-04	73001	2002-04	118154	2006-04	216389
1998-05	94226	2002-05	139852	2006-05	241425
1998-06	83658	2002-06	122538		
1998-07	83314	2002-07	132846		
1998-08	79355	2002-08	131633		
1998-09	76483	2002-09	122049		
1998-10	85116	2002-10	128514		
1998-11	73459	2002-11	124183		
1998-12	72169	2002-12	117266		
1999-01	64493	2003-01	125994		
1999-02	71501	2003-02	103632		
1999-03	84098	2003-03	146740		
1999-04	76650	2003-04	140314		
1999-05	88907	2003-05	155814		
1999-06	84460	2003-06	157306		
1999-07	86353	2003-07	165586		
1999-08	81895	2003-08	160335		
1999-09	78372	2003-09	165216		
1999-10	89606	2003-10	174481		
1999-11	77845	2003-11	135111		
1999-12	73131	2003-12	169871		

'Other Non-metallic Minerals' Import Data (in 000$) D26

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	33072	2000-01	29069	2004-01	44066
1996-02	23698	2000-02	29142	2004-02	43083
1996-03	39218	2000-03	35122	2004-03	56980
1996-04	38859	2000-04	33885	2004-04	59813
1996-05	49243	2000-05	35836	2004-05	62585
1996-06	45494	2000-06	41463	2004-06	66617
1996-07	38699	2000-07	37962	2004-07	67960
1996-08	36375	2000-08	37260	2004-08	60292
1996-09	35898	2000-09	34511	2004-09	59772
1996-10	36617	2000-10	41307	2004-10	57537
1996-11	46037	2000-11	39403	2004-11	61534
1996-12	35892	2000-12	33061	2004-12	77257
1997-01	29133	2001-01	38129	2005-01	53378
1997-02	25405	2001-02	28439	2005-02	66094
1997-03	32803	2001-03	25149	2005-03	82514
1997-04	26853	2001-04	25636	2005-04	78226
1997-05	44709	2001-05	26189	2005-05	81452
1997-06	37044	2001-06	25104	2005-06	85013
1997-07	36226	2001-07	26073	2005-07	78422
1997-08	36468	2001-08	26116	2005-08	103307
1997-09	40284	2001-09	22954	2005-09	104943
1997-10	38354	2001-10	27295	2005-10	85984
1997-11	46808	2001-11	29228	2005-11	87982
1997-12	43679	2001-12	24293	2005-12	101459
1998-01	36439	2002-01	24042	2006-01	69461
1998-02	37823	2002-02	24080	2006-02	98087
1998-03	50690	2002-03	27736	2006-03	114631
1998-04	36229	2002-04	26881	2006-04	100661
1998-05	41339	2002-05	33508	2006-05	123166
1998-06	43815	2002-06	32852		
1998-07	42387	2002-07	39828		
1998-08	42400	2002-08	39792		
1998-09	38192	2002-09	36838		
1998-10	40233	2002-10	38810		
1998-11	44125	2002-11	43737		
1998-12	43835	2002-12	43563		
1999-01	24977	2003-01	32030		
1999-02	30242	2003-02	28939		
1999-03	36025	2003-03	36638		
1999-04	40972	2003-04	39073		
1999-05	38724	2003-05	42276		
1999-06	38296	2003-06	43594		
1999-07	36756	2003-07	50127		
1999-08	30655	2003-08	47308		
1999-09	34827	2003-09	43513		
1999-10	30140	2003-10	50450		
1999-11	34766	2003-11	43039		
1999-12	34687	2003-12	58607		

'Manufacture of Basic Metals' Export Data (in 000$) D27

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	148840	2000-01	182365	2004-01	345375
1996-02	208860	2000-02	173384	2004-02	320343
1996-03	210680	2000-03	229345	2004-03	493990
1996-04	184057	2000-04	176164	2004-04	538839
1996-05	217990	2000-05	251226	2004-05	737677
1996-06	136228	2000-06	194414	2004-06	730134
1996-07	170895	2000-07	183132	2004-07	550914
1996-08	192338	2000-08	156193	2004-08	521153
1996-09	167337	2000-09	186478	2004-09	626857
1996-10	164506	2000-10	133129	2004-10	654076
1996-11	186909	2000-11	172634	2004-11	671390
1996-12	245080	2000-12	208600	2004-12	624880
1997-01	227378	2001-01	170303	2005-01	502170
1997-02	192417	2001-02	209229	2005-02	585977
1997-03	217176	2001-03	218618	2005-03	638928
1997-04	200467	2001-04	242364	2005-04	634226
1997-05	211443	2001-05	317241	2005-05	642954
1997-06	226670	2001-06	240438	2005-06	624841
1997-07	202901	2001-07	279134	2005-07	428821
1997-08	177609	2001-08	247217	2005-08	494571
1997-09	190193	2001-09	185027	2005-09	536166
1997-10	223411	2001-10	244078	2005-10	570078
1997-11	224777	2001-11	280191	2005-11	517304
1997-12	302811	2001-12	287370	2005-12	711633
1998-01	203681	2002-01	287439	2006-01	561318
1998-02	225223	2002-02	219385	2006-02	561284
1998-03	176471	2002-03	313524	2006-03	745324
1998-04	175272	2002-04	247655	2006-04	583132
1998-05	187385	2002-05	302743	2006-05	740473
1998-06	192390	2002-06	205648		
1998-07	192925	2002-07	255718		
1998-08	162055	2002-08	260696		
1998-09	172788	2002-09	289404		
1998-10	169080	2002-10	286068		
1998-11	185946	2002-11	274339		
1998-12	154757	2002-12	296732		
1999-01	153881	2003-01	300084		
1999-02	136165	2003-02	273608		
1999-03	174421	2003-03	367299		
1999-04	165803	2003-04	305928		
1999-05	166065	2003-05	359257		
1999-06	172351	2003-06	287164		
1999-07	210481	2003-07	344298		
1999-08	158375	2003-08	338600		
1999-09	185093	2003-09	297233		
1999-10	179981	2003-10	390836		
1999-11	191989	2003-11	246852		
1999-12	169205	2003-12	373287		

'Manufacture of Basic Metals' Import Data (in 000$) D27

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	225236	2000-01	214625	2004-01	622323
1996-02	156977	2000-02	250969	2004-02	704168
1996-03	275023	2000-03	300009	2004-03	936883
1996-04	241974	2000-04	273583	2004-04	987522
1996-05	256989	2000-05	317413	2004-05	796213
1996-06	212143	2000-06	373109	2004-06	865636
1996-07	269402	2000-07	347674	2004-07	1111397
1996-08	226530	2000-08	341460	2004-08	884676
1996-09	224477	2000-09	287535	2004-09	941704
1996-10	213745	2000-10	286661	2004-10	858294
1996-11	245704	2000-11	300753	2004-11	947154
1996-12	247858	2000-12	240684	2004-12	1427579
1997-01	233999	2001-01	316267	2005-01	1000806
1997-02	235782	2001-02	267356	2005-02	1171567
1997-03	283917	2001-03	186757	2005-03	1339566
1997-04	211404	2001-04	188478	2005-04	1113005
1997-05	284378	2001-05	222059	2005-05	1197079
1997-06	276404	2001-06	265573	2005-06	1153744
1997-07	288272	2001-07	270325	2005-07	1236031
1997-08	313459	2001-08	388679	2005-08	1226532
1997-09	312176	2001-09	395644	2005-09	1104118
1997-10	280248	2001-10	476103	2005-10	982526
1997-11	286528	2001-11	383651	2005-11	911293
1997-12	306660	2001-12	251122	2005-12	1245787
1998-01	256649	2002-01	349546	2006-01	873288
1998-02	251684	2002-02	266010	2006-02	1013005
1998-03	327786	2002-03	351186	2006-03	1229918
1998-04	283073	2002-04	402829	2006-04	1320774
1998-05	305837	2002-05	353597	2006-05	1854347
1998-06	319134	2002-06	308636		
1998-07	304047	2002-07	489977		
1998-08	236427	2002-08	514852		
1998-09	218548	2002-09	411124		
1998-10	222755	2002-10	469882		
1998-11	202465	2002-11	392494		
1998-12	212340	2002-12	397316		
1999-01	128060	2003-01	413983		
1999-02	152490	2003-02	514667		
1999-03	154379	2003-03	694216		
1999-04	173709	2003-04	535942		
1999-05	191468	2003-05	536741		
1999-06	194478	2003-06	697458		
1999-07	201832	2003-07	819672		
1999-08	199004	2003-08	751514		
1999-09	253319	2003-09	655438		
1999-10	237970	2003-10	658015		
1999-11	235621	2003-11	400979		
1999-12	268055	2003-12	624920		

Manufacture of Fabricated Metal Prod (exc. machinery)' Export Data (in 000$) D28

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	34257	2000-01	44214	2004-01	152050
1996-02	29280	2000-02	56656	2004-02	136075
1996-03	37143	2000-03	55880	2004-03	183643
1996-04	39506	2000-04	62281	2004-04	186121
1996-05	39411	2000-05	50525	2004-05	166859
1996-06	41445	2000-06	57098	2004-06	185084
1996-07	36565	2000-07	54417	2004-07	190744
1996-08	39720	2000-08	53929	2004-08	176901
1996-09	43379	2000-09	55962	2004-09	201117
1996-10	39603	2000-10	56691	2004-10	212803
1996-11	41009	2000-11	55560	2004-11	191608
1996-12	40593	2000-12	57557	2004-12	216701
1997-01	35451	2001-01	53245	2005-01	167578
1997-02	34701	2001-02	58946	2005-02	194211
1997-03	41855	2001-03	56169	2005-03	231364
1997-04	36124	2001-04	58071	2005-04	223166
1997-05	41884	2001-05	67514	2005-05	225245
1997-06	42480	2001-06	61864	2005-06	220619
1997-07	53123	2001-07	55733	2005-07	211173
1997-08	39992	2001-08	61832	2005-08	232512
1997-09	44093	2001-09	64387	2005-09	250733
1997-10	49637	2001-10	69116	2005-10	238114
1997-11	54856	2001-11	68868	2005-11	224673
1997-12	47826	2001-12	57726	2005-12	265216
1998-01	47471	2002-01	61016	2006-01	168374
1998-02	46951	2002-02	55801	2006-02	226042
1998-03	62343	2002-03	68681	2006-03	286187
1998-04	46468	2002-04	75594	2006-04	236157
1998-05	55534	2002-05	80882	2006-05	263830
1998-06	59455	2002-06	70016		
1998-07	56987	2002-07	80175		
1998-08	57381	2002-08	80706		
1998-09	62607	2002-09	84262		
1998-10	60343	2002-10	94458		
1998-11	54207	2002-11	97302		
1998-12	54555	2002-12	83448		
1999-01	49609	2003-01	103742		
1999-02	43815	2003-02	73998		
1999-03	58315	2003-03	108844		
1999-04	46501	2003-04	108182		
1999-05	58654	2003-05	116445		
1999-06	59448	2003-06	118824		
1999-07	56470	2003-07	126105		
1999-08	50592	2003-08	127284		
1999-09	58388	2003-09	141521		
1999-10	60231	2003-10	163020		
1999-11	53390	2003-11	142093		
1999-12	52508	2003-12	173036		

‘Manufacture of Fabricated Metal Prod (exc. machinery)’ Import Data (in 000$) D28

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	68800	2000-01	46695	2004-01	90380
1996-02	44610	2000-02	63760	2004-02	85350
1996-03	63564	2000-03	69996	2004-03	117660
1996-04	65126	2000-04	68007	2004-04	123201
1996-05	98531	2000-05	78058	2004-05	127972
1996-06	83484	2000-06	79581	2004-06	136707
1996-07	96211	2000-07	85864	2004-07	140410
1996-08	75352	2000-08	86022	2004-08	133547
1996-09	63304	2000-09	75881	2004-09	142302
1996-10	81463	2000-10	81496	2004-10	145626
1996-11	90396	2000-11	74994	2004-11	152614
1996-12	84543	2000-12	62435	2004-12	177836
1997-01	61795	2001-01	72913	2005-01	113362
1997-02	58375	2001-02	58020	2005-02	137101
1997-03	62947	2001-03	47079	2005-03	156772
1997-04	58892	2001-04	67914	2005-04	157333
1997-05	86608	2001-05	71895	2005-05	177718
1997-06	82594	2001-06	60443	2005-06	187966
1997-07	98280	2001-07	90006	2005-07	173311
1997-08	87967	2001-08	103166	2005-08	165922
1997-09	107120	2001-09	64879	2005-09	181746
1997-10	100817	2001-10	73811	2005-10	165421
1997-11	82252	2001-11	81208	2005-11	157734
1997-12	89687	2001-12	79696	2005-12	168614
1998-01	83780	2002-01	57515	2006-01	114427
1998-02	76866	2002-02	78597	2006-02	170636
1998-03	87391	2002-03	76831	2006-03	197007
1998-04	91586	2002-04	101361	2006-04	183003
1998-05	95524	2002-05	105546	2006-05	220278
1998-06	96713	2002-06	95778		
1998-07	88845	2002-07	113900		
1998-08	75395	2002-08	76666		
1998-09	82361	2002-09	87904		
1998-10	90027	2002-10	85743		
1998-11	82022	2002-11	116679		
1998-12	83314	2002-12	88681		
1999-01	43910	2003-01	83453		
1999-02	63190	2003-02	65368		
1999-03	71541	2003-03	93580		
1999-04	77001	2003-04	85460		
1999-05	69349	2003-05	89009		
1999-06	75078	2003-06	90898		
1999-07	67444	2003-07	109441		
1999-08	73589	2003-08	89779		
1999-09	80400	2003-09	102627		
1999-10	67623	2003-10	108947		
1999-11	69667	2003-11	77185		
1999-12	76057	2003-12	136841		

'Manufacture of Machinery and Equipment' Export Data (in 000$) D29

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	53657	2000-01	91750	2004-01	269864
1996-02	50449	2000-02	100655	2004-02	239812
1996-03	65337	2000-03	117638	2004-03	341699
1996-04	65536	2000-04	116413	2004-04	345511
1996-05	73932	2000-05	121292	2004-05	316819
1996-06	70132	2000-06	114665	2004-06	316513
1996-07	71396	2000-07	118541	2004-07	364407
1996-08	68771	2000-08	113734	2004-08	309705
1996-09	71081	2000-09	125281	2004-09	333388
1996-10	72369	2000-10	118788	2004-10	348819
1996-11	75205	2000-11	117368	2004-11	328904
1996-12	90873	2000-12	119831	2004-12	397912
1997-01	70525	2001-01	105271	2005-01	279460
1997-02	60333	2001-02	121015	2005-02	324527
1997-03	82153	2001-03	123648	2005-03	418750
1997-04	69981	2001-04	121750	2005-04	416742
1997-05	82783	2001-05	138914	2005-05	394216
1997-06	84708	2001-06	137505	2005-06	422400
1997-07	87264	2001-07	140874	2005-07	418736
1997-08	83730	2001-08	128620	2005-08	416320
1997-09	83932	2001-09	121766	2005-09	428800
1997-10	100492	2001-10	149402	2005-10	421951
1997-11	100504	2001-11	140771	2005-11	381902
1997-12	93931	2001-12	134850	2005-12	541223
1998-01	73884	2002-01	112847	2006-01	285586
1998-02	70512	2002-02	118673	2006-02	411834
1998-03	106288	2002-03	142254	2006-03	501216
1998-04	72973	2002-04	148497	2006-04	449269
1998-05	102151	2002-05	164531	2006-05	493307
1998-06	113785	2002-06	170034		
1998-07	89616	2002-07	181900		
1998-08	92261	2002-08	186299		
1998-09	89979	2002-09	208540		
1998-10	104057	2002-10	191461		
1998-11	95090	2002-11	226877		
1998-12	96857	2002-12	225599		
1999-01	68657	2003-01	183311		
1999-02	87076	2003-02	158299		
1999-03	111979	2003-03	247066		
1999-04	74497	2003-04	233318		
1999-05	113505	2003-05	281165		
1999-06	112648	2003-06	241935		
1999-07	103831	2003-07	324693		
1999-08	88737	2003-08	250246		
1999-09	106181	2003-09	291337		
1999-10	137834	2003-10	328992		
1999-11	108070	2003-11	272592		
1999-12	98722	2003-12	305557		

'Manufacture of Machinery and Equipment' Import Data (in 000$) D29

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	492009	2000-01	334773	2004-01	652878
1996-02	365103	2000-02	354263	2004-02	630481
1996-03	579909	2000-03	401820	2004-03	948144
1996-04	556878	2000-04	427447	2004-04	826821
1996-05	611891	2000-05	508292	2004-05	889847
1996-06	577531	2000-06	560914	2004-06	919696
1996-07	706425	2000-07	549881	2004-07	944407
1996-08	650883	2000-08	551726	2004-08	843500
1996-09	566539	2000-09	480366	2004-09	828927
1996-10	632202	2000-10	509146	2004-10	799905
1996-11	783460	2000-11	543128	2004-11	855895
1996-12	945962	2000-12	616118	2004-12	1222310
1997-01	585329	2001-01	499344	2005-01	671852
1997-02	434180	2001-02	378193	2005-02	819284
1997-03	608275	2001-03	351376	2005-03	1063375
1997-04	521553	2001-04	396404	2005-04	988753
1997-05	695642	2001-05	545081	2005-05	1083468
1997-06	681291	2001-06	462516	2005-06	1095942
1997-07	719465	2001-07	333031	2005-07	1093835
1997-08	644976	2001-08	441144	2005-08	1084148
1997-09	671027	2001-09	415258	2005-09	1015415
1997-10	759325	2001-10	300966	2005-10	1001781
1997-11	692601	2001-11	345702	2005-11	945839
1997-12	978653	2001-12	467864	2005-12	1345965
1998-01	496391	2002-01	290832	2006-01	727777
1998-02	622802	2002-02	356089	2006-02	924188
1998-03	710912	2002-03	425069	2006-03	1246102
1998-04	578065	2002-04	442567	2006-04	1155836
1998-05	752075	2002-05	497808	2006-05	1359811
1998-06	739077	2002-06	533803		
1998-07	743638	2002-07	638731		
1998-08	609170	2002-08	567603		
1998-09	570451	2002-09	559171		
1998-10	573712	2002-10	615088		
1998-11	567332	2002-11	643317		
1998-12	714647	2002-12	904165		
1999-01	269156	2003-01	395178		
1999-02	364625	2003-02	421115		
1999-03	405310	2003-03	588513		
1999-04	423252	2003-04	616061		
1999-05	479986	2003-05	685885		
1999-06	474225	2003-06	696523		
1999-07	469732	2003-07	825227		
1999-08	387314	2003-08	677321		
1999-09	369368	2003-09	681291		
1999-10	384645	2003-10	756003		
1999-11	424091	2003-11	560832		
1999-12	613483	2003-12	1237361		

'Office, Accounting and Computing Machinery' Export Data (in 000$) D30

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	1509	2000-01	3452	2004-01	3750
1996-02	1649	2000-02	3749	2004-02	2785
1996-03	3121	2000-03	3922	2004-03	4800
1996-04	1292	2000-04	7410	2004-04	3477
1996-05	1439	2000-05	3176	2004-05	4051
1996-06	1668	2000-06	5777	2004-06	3366
1996-07	1352	2000-07	3854	2004-07	5580
1996-08	1430	2000-08	4320	2004-08	5330
1996-09	1321	2000-09	5303	2004-09	4715
1996-10	1687	2000-10	5526	2004-10	4996
1996-11	2042	2000-11	9957	2004-11	4340
1996-12	2778	2000-12	6650	2004-12	4948
1997-01	1840	2001-01	6356	2005-01	3506
1997-02	2123	2001-02	4132	2005-02	4928
1997-03	2541	2001-03	7030	2005-03	6898
1997-04	1829	2001-04	4401	2005-04	5225
1997-05	3036	2001-05	4134	2005-05	5639
1997-06	2377	2001-06	4539	2005-06	5272
1997-07	2886	2001-07	4821	2005-07	5528
1997-08	2728	2001-08	2625	2005-08	6175
1997-09	2115	2001-09	2763	2005-09	6316
1997-10	2611	2001-10	2900	2005-10	7320
1997-11	2817	2001-11	3207	2005-11	5739
1997-12	1961	2001-12	5560	2005-12	6954
1998-01	2842	2002-01	2312	2006-01	4562
1998-02	2766	2002-02	4064	2006-02	6152
1998-03	3596	2002-03	4369	2006-03	7747
1998-04	2378	2002-04	3801	2006-04	9678
1998-05	2863	2002-05	5260	2006-05	7225
1998-06	2562	2002-06	2492		
1998-07	3646	2002-07	4936		
1998-08	3009	2002-08	1612		
1998-09	3320	2002-09	1970		
1998-10	2634	2002-10	3104		
1998-11	5754	2002-11	2990		
1998-12	7250	2002-12	2755		
1999-01	2760	2003-01	2372		
1999-02	5392	2003-02	2176		
1999-03	5432	2003-03	3025		
1999-04	4192	2003-04	3112		
1999-05	3692	2003-05	3329		
1999-06	3837	2003-06	2952		
1999-07	3345	2003-07	2845		
1999-08	2804	2003-08	2912		
1999-09	9235	2003-09	3736		
1999-10	8866	2003-10	4664		
1999-11	5392	2003-11	4317		
1999-12	5089	2003-12	5381		

‘Office, Accounting and Computing Machinery’ Import Data (in 000$) D30

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	54187	2000-01	103331	2004-01	120451
1996-02	39048	2000-02	120912	2004-02	118791
1996-03	59138	2000-03	153941	2004-03	144970
1996-04	70524	2000-04	138220	2004-04	110809
1996-05	58479	2000-05	121683	2004-05	135789
1996-06	58486	2000-06	123786	2004-06	130834
1996-07	51984	2000-07	122666	2004-07	123901
1996-08	61988	2000-08	122784	2004-08	108007
1996-09	65036	2000-09	129964	2004-09	158496
1996-10	73534	2000-10	150341	2004-10	156675
1996-11	69501	2000-11	151571	2004-11	183300
1996-12	113676	2000-12	155647	2004-12	274780
1997-01	72866	2001-01	84286	2005-01	143338
1997-02	60564	2001-02	87654	2005-02	148142
1997-03	71106	2001-03	59012	2005-03	196323
1997-04	62516	2001-04	40700	2005-04	178182
1997-05	74695	2001-05	49863	2005-05	199262
1997-06	71479	2001-06	50350	2005-06	213083
1997-07	81560	2001-07	55077	2005-07	149010
1997-08	56402	2001-08	42930	2005-08	173227
1997-09	75636	2001-09	50198	2005-09	222262
1997-10	84647	2001-10	73347	2005-10	212905
1997-11	83483	2001-11	83477	2005-11	288563
1997-12	118565	2001-12	104885	2005-12	340409
1998-01	64367	2002-01	37713	2006-01	181676
1998-02	96020	2002-02	61680	2006-02	231544
1998-03	92423	2002-03	81368	2006-03	275549
1998-04	74624	2002-04	95580	2006-04	202513
1998-05	75352	2002-05	77158	2006-05	225344
1998-06	84392	2002-06	74163		
1998-07	86040	2002-07	73455		
1998-08	60279	2002-08	71108		
1998-09	88951	2002-09	83756		
1998-10	91361	2002-10	97726		
1998-11	101219	2002-11	97253		
1998-12	147984	2002-12	136795		
1999-01	64521	2003-01	69019		
1999-02	79335	2003-02	62440		
1999-03	92149	2003-03	87489		
1999-04	88503	2003-04	87210		
1999-05	83591	2003-05	94492		
1999-06	85612	2003-06	98865		
1999-07	95446	2003-07	106436		
1999-08	80911	2003-08	91374		
1999-09	104100	2003-09	98958		
1999-10	111508	2003-10	122786		
1999-11	144122	2003-11	90178		
1999-12	177135	2003-12	203257		

'Electrical Machinery and Apparatus' Export Data (in 000$) D31

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	60079	2000-01	51136	2004-01	117276
1996-02	58197	2000-02	62984	2004-02	103257
1996-03	56791	2000-03	64077	2004-03	119554
1996-04	57683	2000-04	69507	2004-04	130081
1996-05	58141	2000-05	64327	2004-05	124493
1996-06	65755	2000-06	58597	2004-06	141778
1996-07	69230	2000-07	69034	2004-07	139580
1996-08	56551	2000-08	60510	2004-08	118366
1996-09	68784	2000-09	69325	2004-09	153727
1996-10	73441	2000-10	70901	2004-10	138779
1996-11	70129	2000-11	79098	2004-11	132356
1996-12	76875	2000-12	105753	2004-12	156342
1997-01	76737	2001-01	85838	2005-01	117276
1997-02	61050	2001-02	85437	2005-02	152781
1997-03	66064	2001-03	83193	2005-03	166955
1997-04	58877	2001-04	93213	2005-04	162369
1997-05	59088	2001-05	105325	2005-05	166293
1997-06	65655	2001-06	75610	2005-06	169685
1997-07	59850	2001-07	77353	2005-07	177291
1997-08	55164	2001-08	92719	2005-08	149254
1997-09	57571	2001-09	87952	2005-09	176892
1997-10	66449	2001-10	85470	2005-10	161173
1997-11	58781	2001-11	87077	2005-11	154660
1997-12	58095	2001-12	79216	2005-12	178123
1998-01	66785	2002-01	89435	2006-01	128782
1998-02	47712	2002-02	79470	2006-02	172687
1998-03	68931	2002-03	91426	2006-03	221264
1998-04	57442	2002-04	86698	2006-04	187674
1998-05	71244	2002-05	97779	2006-05	238748
1998-06	59797	2002-06	81178		
1998-07	60801	2002-07	94097		
1998-08	61025	2002-08	83973		
1998-09	66670	2002-09	86123		
1998-10	73186	2002-10	86521		
1998-11	64075	2002-11	98171		
1998-12	58207	2002-12	82207		
1999-01	47666	2003-01	97742		
1999-02	61403	2003-02	78743		
1999-03	56668	2003-03	105341		
1999-04	50867	2003-04	82954		
1999-05	64061	2003-05	100242		
1999-06	58799	2003-06	88518		
1999-07	45181	2003-07	107163		
1999-08	49540	2003-08	97572		
1999-09	63768	2003-09	110108		
1999-10	66897	2003-10	129652		
1999-11	66764	2003-11	104543		
1999-12	60588	2003-12	118052		

'Electrical Machinery and Apparatus' Import Data (in 000$) D31

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	97734	2000-01	112656	2004-01	187562
1996-02	77778	2000-02	127465	2004-02	185714
1996-03	98305	2000-03	129459	2004-03	269457
1996-04	89102	2000-04	130571	2004-04	290732
1996-05	100042	2000-05	149553	2004-05	256783
1996-06	81342	2000-06	145924	2004-06	274729
1996-07	100156	2000-07	128576	2004-07	255551
1996-08	88397	2000-08	126218	2004-08	214784
1996-09	113207	2000-09	137704	2004-09	297427
1996-10	112545	2000-10	148806	2004-10	294744
1996-11	119110	2000-11	131384	2004-11	301869
1996-12	143887	2000-12	132978	2004-12	345773
1997-01	119389	2001-01	132721	2005-01	263237
1997-02	88494	2001-02	98303	2005-02	295284
1997-03	118713	2001-03	98249	2005-03	337948
1997-04	98690	2001-04	90852	2005-04	315547
1997-05	118321	2001-05	130040	2005-05	390846
1997-06	107799	2001-06	90550	2005-06	324053
1997-07	123303	2001-07	123122	2005-07	283719
1997-08	125521	2001-08	98819	2005-08	333817
1997-09	125741	2001-09	78583	2005-09	406679
1997-10	167653	2001-10	89592	2005-10	396944
1997-11	138532	2001-11	97287	2005-11	417636
1997-12	140142	2001-12	92831	2005-12	440884
1998-01	113097	2002-01	117900	2006-01	385881
1998-02	137367	2002-02	113498	2006-02	413017
1998-03	161218	2002-03	121208	2006-03	393672
1998-04	130801	2002-04	157760	2006-04	395137
1998-05	139784	2002-05	178429	2006-05	376131
1998-06	132557	2002-06	137078		
1998-07	150146	2002-07	133087		
1998-08	109254	2002-08	126888		
1998-09	146109	2002-09	125829		
1998-10	119494	2002-10	157352		
1998-11	159977	2002-11	169181		
1998-12	152805	2002-12	162885		
1999-01	88995	2003-01	126246		
1999-02	118412	2003-02	122003		
1999-03	123860	2003-03	150517		
1999-04	132543	2003-04	144756		
1999-05	114340	2003-05	172215		
1999-06	147808	2003-06	158291		
1999-07	127623	2003-07	160658		
1999-08	116277	2003-08	160459		
1999-09	129411	2003-09	160533		
1999-10	118044	2003-10	238572		
1999-11	115001	2003-11	175725		
1999-12	233440	2003-12	265777		

'Communication and Apparatus' Export Data (in 000$) D32

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	20509	2000-01	74534	2004-01	153189
1996-02	21514	2000-02	79571	2004-02	162811
1996-03	28801	2000-03	66913	2004-03	249554
1996-04	18787	2000-04	92451	2004-04	258592
1996-05	22728	2000-05	69318	2004-05	211979
1996-06	18013	2000-06	102694	2004-06	160795
1996-07	23273	2000-07	48338	2004-07	184101
1996-08	24667	2000-08	86559	2004-08	189966
1996-09	22858	2000-09	75921	2004-09	253940
1996-10	45629	2000-10	84210	2004-10	344100
1996-11	34631	2000-11	89866	2004-11	343067
1996-12	35082	2000-12	91494	2004-12	370931
1997-01	25831	2001-01	52809	2005-01	169368
1997-02	23923	2001-02	84430	2005-02	223955
1997-03	32092	2001-03	80204	2005-03	289456
1997-04	31945	2001-04	75658	2005-04	262940
1997-05	37946	2001-05	73367	2005-05	200661
1997-06	29923	2001-06	71934	2005-06	179377
1997-07	32960	2001-07	56919	2005-07	176110
1997-08	42680	2001-08	76199	2005-08	229966
1997-09	42449	2001-09	104253	2005-09	283719
1997-10	56748	2001-10	106603	2005-10	353140
1997-11	64819	2001-11	112050	2005-11	354652
1997-12	48219	2001-12	107842	2005-12	426853
1998-01	45994	2002-01	92542	2006-01	162697
1998-02	60194	2002-02	82838	2006-02	276777
1998-03	71118	2002-03	109209	2006-03	335035
1998-04	71407	2002-04	131953	2006-04	283705
1998-05	83134	2002-05	113664	2006-05	246390
1998-06	64105	2002-06	95531		
1998-07	60239	2002-07	116974		
1998-08	77842	2002-08	141883		
1998-09	74213	2002-09	150114		
1998-10	76849	2002-10	171633		
1998-11	79705	2002-11	189615		
1998-12	97319	2002-12	179016		
1999-01	42956	2003-01	122671		
1999-02	61548	2003-02	115024		
1999-03	71756	2003-03	148461		
1999-04	63928	2003-04	119376		
1999-05	60539	2003-05	108937		
1999-06	72850	2003-06	125487		
1999-07	30344	2003-07	151868		
1999-08	52601	2003-08	143950		
1999-09	66908	2003-09	189934		
1999-10	82127	2003-10	229920		
1999-11	90150	2003-11	212456		
1999-12	74989	2003-12	279664		

'Communication and Apparatus' Import Data (in 000$) D32

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	97537	2000-01	220795	2004-01	295469
1996-02	86669	2000-02	289808	2004-02	287579
1996-03	117925	2000-03	326279	2004-03	433137
1996-04	121814	2000-04	357095	2004-04	344923
1996-05	115578	2000-05	365380	2004-05	398789
1996-06	92967	2000-06	383490	2004-06	384476
1996-07	110652	2000-07	428672	2004-07	372314
1996-08	101657	2000-08	362686	2004-08	345212
1996-09	119232	2000-09	303739	2004-09	422116
1996-10	126401	2000-10	330585	2004-10	389025
1996-11	127341	2000-11	389317	2004-11	394962
1996-12	173615	2000-12	235874	2004-12	462052
1997-01	123827	2001-01	237566	2005-01	258757
1997-02	110923	2001-02	195856	2005-02	376214
1997-03	138752	2001-03	170049	2005-03	466210
1997-04	144497	2001-04	193690	2005-04	428800
1997-05	154671	2001-05	144412	2005-05	324021
1997-06	148802	2001-06	189199	2005-06	365619
1997-07	191206	2001-07	150480	2005-07	314366
1997-08	162090	2001-08	137711	2005-08	344936
1997-09	169552	2001-09	134398	2005-09	396116
1997-10	176439	2001-10	154580	2005-10	373219
1997-11	198117	2001-11	156860	2005-11	433694
1997-12	224637	2001-12	170277	2005-12	522780
1998-01	115439	2002-01	126652	2006-01	276420
1998-02	161894	2002-02	143683	2006-02	429431
1998-03	183858	2002-03	175305	2006-03	438910
1998-04	166840	2002-04	194470	2006-04	387668
1998-05	156050	2002-05	215461	2006-05	362781
1998-06	157125	2002-06	157583		
1998-07	205131	2002-07	176803		
1998-08	194353	2002-08	187009		
1998-09	256329	2002-09	236711		
1998-10	228343	2002-10	212824		
1998-11	259689	2002-11	251965		
1998-12	268631	2002-12	257238		
1999-01	134807	2003-01	187757		
1999-02	200017	2003-02	166345		
1999-03	247872	2003-03	234581		
1999-04	230675	2003-04	208387		
1999-05	302858	2003-05	220560		
1999-06	282576	2003-06	270245		
1999-07	234213	2003-07	243778		
1999-08	266649	2003-08	259656		
1999-09	304282	2003-09	329990		
1999-10	369478	2003-10	302446		
1999-11	280742	2003-11	231704		
1999-12	290974	2003-12	373888		

'Medical, Precision and Optical Instruments, Watches' Export Data (in 000$) D33

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	6105	2000-01	4252	2004-01	11814
1996-02	3514	2000-02	5923	2004-02	9456
1996-03	4983	2000-03	6961	2004-03	13615
1996-04	3783	2000-04	5082	2004-04	13580
1996-05	3819	2000-05	4784	2004-05	13250
1996-06	3852	2000-06	7184	2004-06	15778
1996-07	4567	2000-07	7405	2004-07	21759
1996-08	4982	2000-08	5205	2004-08	12350
1996-09	6491	2000-09	6955	2004-09	17552
1996-10	3751	2000-10	5120	2004-10	13445
1996-11	5054	2000-11	8264	2004-11	14091
1996-12	5733	2000-12	8066	2004-12	16721
1997-01	4275	2001-01	6600	2005-01	15146
1997-02	4635	2001-02	7084	2005-02	14605
1997-03	5002	2001-03	5276	2005-03	16632
1997-04	4597	2001-04	5984	2005-04	13564
1997-05	6778	2001-05	8184	2005-05	15205
1997-06	4249	2001-06	6135	2005-06	18451
1997-07	4847	2001-07	4699	2005-07	15227
1997-08	5103	2001-08	5397	2005-08	17096
1997-09	4766	2001-09	5224	2005-09	19701
1997-10	4907	2001-10	6605	2005-10	17900
1997-11	5346	2001-11	7310	2005-11	14073
1997-12	6493	2001-12	8854	2005-12	19905
1998-01	4664	2002-01	5881	2006-01	14444
1998-02	4407	2002-02	5805	2006-02	17292
1998-03	7429	2002-03	6179	2006-03	20486
1998-04	5788	2002-04	5120	2006-04	19215
1998-05	7680	2002-05	8241	2006-05	17041
1998-06	5375	2002-06	7670		
1998-07	7930	2002-07	6328		
1998-08	4512	2002-08	9579		
1998-09	5449	2002-09	7825		
1998-10	7799	2002-10	9130		
1998-11	7161	2002-11	10032		
1998-12	7090	2002-12	7188		
1999-01	5071	2003-01	9724		
1999-02	5094	2003-02	7598		
1999-03	6196	2003-03	9719		
1999-04	4482	2003-04	10571		
1999-05	5634	2003-05	10567		
1999-06	4894	2003-06	12998		
1999-07	6841	2003-07	11641		
1999-08	4919	2003-08	10654		
1999-09	5610	2003-09	10491		
1999-10	5044	2003-10	10886		
1999-11	6089	2003-11	10372		
1999-12	6962	2003-12	13982		

'Medical, Precision and Optical Instruments, Watches' Import Data (in 000$) D33

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	59383	2000-01	90653	2004-01	119769
1996-02	53627	2000-02	94565	2004-02	133224
1996-03	88876	2000-03	96538	2004-03	170189
1996-04	75307	2000-04	100305	2004-04	152534
1996-05	99002	2000-05	107845	2004-05	172531
1996-06	102566	2000-06	124804	2004-06	193766
1996-07	95504	2000-07	112981	2004-07	175487
1996-08	75800	2000-08	101336	2004-08	152880
1996-09	87551	2000-09	116043	2004-09	159636
1996-10	89908	2000-10	100253	2004-10	155698
1996-11	97996	2000-11	163568	2004-11	183660
1996-12	116541	2000-12	131716	2004-12	284190
1997-01	83691	2001-01	102914	2005-01	159273
1997-02	65899	2001-02	82343	2005-02	174910
1997-03	94016	2001-03	76328	2005-03	216645
1997-04	81336	2001-04	73775	2005-04	205643
1997-05	100482	2001-05	91649	2005-05	211428
1997-06	101696	2001-06	74457	2005-06	238870
1997-07	101030	2001-07	82526	2005-07	215491
1997-08	104242	2001-08	92882	2005-08	213886
1997-09	106649	2001-09	68130	2005-09	246840
1997-10	100478	2001-10	76680	2005-10	199521
1997-11	98207	2001-11	83536	2005-11	208745
1997-12	145142	2001-12	95424	2005-12	324637
1998-01	78410	2002-01	72383	2006-01	178304
1998-02	86293	2002-02	58989	2006-02	216992
1998-03	113888	2002-03	87266	2006-03	268611
1998-04	93876	2002-04	89795	2006-04	238515
1998-05	125920	2002-05	102556	2006-05	247184
1998-06	114198	2002-06	89636		
1998-07	104215	2002-07	123633		
1998-08	105417	2002-08	101802		
1998-09	106327	2002-09	90652		
1998-10	98977	2002-10	93334		
1998-11	95029	2002-11	109532		
1998-12	117106	2002-12	135924		
1999-01	70730	2003-01	93724		
1999-02	81603	2003-02	84131		
1999-03	79597	2003-03	104422		
1999-04	89027	2003-04	104761		
1999-05	98125	2003-05	112067		
1999-06	102379	2003-06	109504		
1999-07	116784	2003-07	132547		
1999-08	69860	2003-08	101638		
1999-09	94071	2003-09	128894		
1999-10	93606	2003-10	129778		
1999-11	94346	2003-11	109448		
1999-12	133352	2003-12	225800		

'Motor Vehicles and Trailers' Export Data (in 000$) D34

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	69928	2000-01	134032	2004-01	597582
1996-02	78248	2000-02	164340	2004-02	439050
1996-03	103425	2000-03	152850	2004-03	674627
1996-04	98077	2000-04	153103	2004-04	717297
1996-05	74787	2000-05	141747	2004-05	727539
1996-06	73149	2000-06	132124	2004-06	768856
1996-07	80951	2000-07	147750	2004-07	906247
1996-08	75472	2000-08	90704	2004-08	552708
1996-09	42321	2000-09	130294	2004-09	833217
1996-10	54388	2000-10	140565	2004-10	798952
1996-11	74687	2000-11	161817	2004-11	774974
1996-12	150443	2000-12	195720	2004-12	1021567
1997-01	46925	2001-01	180681	2005-01	659281
1997-02	64418	2001-02	235435	2005-02	879519
1997-03	83519	2001-03	237769	2005-03	1040346
1997-04	72393	2001-04	255753	2005-04	923180
1997-05	81782	2001-05	289588	2005-05	925743
1997-06	74896	2001-06	219393	2005-06	892937
1997-07	58502	2001-07	217652	2005-07	855996
1997-08	64992	2001-08	142351	2005-08	530426
1997-09	66087	2001-09	197514	2005-09	900821
1997-10	70841	2001-10	230260	2005-10	896829
1997-11	81835	2001-11	226484	2005-11	752445
1997-12	113757	2001-12	223811	2005-12	968578
1998-01	97217	2002-01	206585	2006-01	652484
1998-02	74970	2002-02	215989	2006-02	883320
1998-03	102950	2002-03	287557	2006-03	1123169
1998-04	87187	2002-04	266140	2006-04	1038961
1998-05	106849	2002-05	335145	2006-05	1154215
1998-06	82847	2002-06	277783		
1998-07	78792	2002-07	314159		
1998-08	75608	2002-08	209221		
1998-09	64439	2002-09	325627		
1998-10	95332	2002-10	390174		
1998-11	92075	2002-11	388248		
1998-12	90905	2002-12	386174		
1999-01	73016	2003-01	338279		
1999-02	102231	2003-02	329609		
1999-03	149693	2003-03	425079		
1999-04	150854	2003-04	467007		
1999-05	161138	2003-05	453600		
1999-06	149129	2003-06	512352		
1999-07	148778	2003-07	497168		
1999-08	75793	2003-08	358689		
1999-09	121311	2003-09	482722		
1999-10	157716	2003-10	539636		
1999-11	153100	2003-11	483321		
1999-12	172032	2003-12	549487		

'Motor Vehicles and Trailers' Import Data (in 000$) D34

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	190364	2000-01	217811	2004-01	589735
1996-02	284136	2000-02	321964	2004-02	658425
1996-03	235971	2000-03	375658	2004-03	1114245
1996-04	228015	2000-04	442105	2004-04	1062279
1996-05	232970	2000-05	523350	2004-05	1184536
1996-06	224869	2000-06	554402	2004-06	1228004
1996-07	284185	2000-07	547359	2004-07	1055641
1996-08	207339	2000-08	561192	2004-08	815680
1996-09	219816	2000-09	534590	2004-09	917194
1996-10	285502	2000-10	712832	2004-10	918821
1996-11	323077	2000-11	732821	2004-11	1053384
1996-12	368680	2000-12	441557	2004-12	1198000
1997-01	199348	2001-01	196117	2005-01	590386
1997-02	206129	2001-02	213935	2005-02	758679
1997-03	274284	2001-03	199279	2005-03	997906
1997-04	281008	2001-04	163684	2005-04	957107
1997-05	391858	2001-05	202453	2005-05	1087814
1997-06	354261	2001-06	233405	2005-06	1086088
1997-07	361607	2001-07	166462	2005-07	892160
1997-08	345981	2001-08	135728	2005-08	1103853
1997-09	443537	2001-09	168647	2005-09	1121292
1997-10	460294	2001-10	142972	2005-10	1185630
1997-11	506356	2001-11	170350	2005-11	1156277
1997-12	573168	2001-12	213092	2005-12	1394699
1998-01	196162	2002-01	113308	2006-01	807145
1998-02	324832	2002-02	114941	2006-02	951310
1998-03	380791	2002-03	156608	2006-03	1186362
1998-04	320139	2002-04	206645	2006-04	1193573
1998-05	445472	2002-05	260740	2006-05	1329596
1998-06	405780	2002-06	231602		
1998-07	344985	2002-07	263364		
1998-08	325561	2002-08	223773		
1998-09	357140	2002-09	272439		
1998-10	357128	2002-10	309543		
1998-11	339072	2002-11	349517		
1998-12	345396	2002-12	415999		
1999-01	103567	2003-01	238867		
1999-02	187416	2003-02	259513		
1999-03	237177	2003-03	353378		
1999-04	267094	2003-04	406706		
1999-05	269132	2003-05	459527		
1999-06	319476	2003-06	505465		
1999-07	245548	2003-07	508166		
1999-08	222591	2003-08	444302		
1999-09	327416	2003-09	597977		
1999-10	340724	2003-10	792578		
1999-11	410492	2003-11	705352		
1999-12	424649	2003-12	1138960		

'Other Transport' Export Data (in 000$) D35

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	23638	2000-01	124764	2004-01	120219
1996-02	17807	2000-02	48844	2004-02	62266
1996-03	6408	2000-03	59578	2004-03	122250
1996-04	4796	2000-04	79160	2004-04	110840
1996-05	17847	2000-05	107931	2004-05	158402
1996-06	7563	2000-06	73773	2004-06	100705
1996-07	18564	2000-07	101547	2004-07	146923
1996-08	11429	2000-08	16600	2004-08	113268
1996-09	2490	2000-09	92019	2004-09	85511
1996-10	6413	2000-10	27518	2004-10	86952
1996-11	26267	2000-11	115946	2004-11	106127
1996-12	11830	2000-12	34418	2004-12	135246
1997-01	15693	2001-01	45413	2005-01	169680
1997-02	5492	2001-02	47402	2005-02	118823
1997-03	43951	2001-03	127939	2005-03	125502
1997-04	13632	2001-04	130046	2005-04	98372
1997-05	14245	2001-05	132812	2005-05	163978
1997-06	27431	2001-06	46303	2005-06	117422
1997-07	9080	2001-07	44631	2005-07	80391
1997-08	11112	2001-08	84539	2005-08	111395
1997-09	25687	2001-09	70033	2005-09	121044
1997-10	25636	2001-10	51516	2005-10	236444
1997-11	71314	2001-11	38736	2005-11	192453
1997-12	39285	2001-12	128831	2005-12	171077
1998-01	27658	2002-01	54127	2006-01	294064
1998-02	18625	2002-02	54988	2006-02	118714
1998-03	30842	2002-03	41208	2006-03	188943
1998-04	18558	2002-04	27134	2006-04	153621
1998-05	29178	2002-05	28025	2006-05	142090
1998-06	10403	2002-06	78846		
1998-07	13262	2002-07	34700		
1998-08	24545	2002-08	45326		
1998-09	39337	2002-09	25952		
1998-10	47711	2002-10	58231		
1998-11	16340	2002-11	49627		
1998-12	38563	2002-12	30576		
1999-01	27893	2003-01	107009		
1999-02	63618	2003-02	33352		
1999-03	25741	2003-03	119133		
1999-04	87525	2003-04	137102		
1999-05	58292	2003-05	39609		
1999-06	13552	2003-06	86640		
1999-07	122426	2003-07	150275		
1999-08	68083	2003-08	93627		
1999-09	16073	2003-09	88406		
1999-10	148476	2003-10	90452		
1999-11	94354	2003-11	33881		
1999-12	44855	2003-12	57825		

'Other Transport' Import Data (in 000$) D35

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	150682	2000-01	101128	2004-01	160769
1996-02	129681	2000-02	127351	2004-02	72849
1996-03	133128	2000-03	74776	2004-03	201410
1996-04	312619	2000-04	208237	2004-04	188692
1996-05	267354	2000-05	89161	2004-05	214389
1996-06	128446	2000-06	120880	2004-06	208921
1996-07	173262	2000-07	108575	2004-07	305423
1996-08	105483	2000-08	121925	2004-08	169043
1996-09	48059	2000-09	168954	2004-09	89062
1996-10	82716	2000-10	65617	2004-10	142462
1996-11	109894	2000-11	171753	2004-11	71963
1996-12	127728	2000-12	116036	2004-12	65145
1997-01	110853	2001-01	88568	2005-01	78444
1997-02	85325	2001-02	99586	2005-02	82401
1997-03	81291	2001-03	26503	2005-03	126152
1997-04	287660	2001-04	66337	2005-04	199399
1997-05	277727	2001-05	153917	2005-05	147918
1997-06	128406	2001-06	115634	2005-06	299323
1997-07	118041	2001-07	312046	2005-07	247521
1997-08	266383	2001-08	102290	2005-08	249758
1997-09	155179	2001-09	125982	2005-09	122888
1997-10	101073	2001-10	50304	2005-10	152784
1997-11	106038	2001-11	145389	2005-11	61216
1997-12	126376	2001-12	73749	2005-12	158847
1998-01	48937	2002-01	151624	2006-01	95152
1998-02	78168	2002-02	47695	2006-02	103970
1998-03	125857	2002-03	102003	2006-03	135800
1998-04	194948	2002-04	182956	2006-04	247263
1998-05	147591	2002-05	59141	2006-05	137828
1998-06	145370	2002-06	60349		
1998-07	212396	2002-07	34358		
1998-08	65502	2002-08	99138		
1998-09	39548	2002-09	65077		
1998-10	64693	2002-10	57354		
1998-11	66093	2002-11	59522		
1998-12	95957	2002-12	41836		
1999-01	95577	2003-01	36213		
1999-02	59684	2003-02	21388		
1999-03	86613	2003-03	45921		
1999-04	131774	2003-04	50264		
1999-05	63785	2003-05	52508		
1999-06	98103	2003-06	31313		
1999-07	208806	2003-07	47729		
1999-08	79267	2003-08	31475		
1999-09	62986	2003-09	27185		
1999-10	36946	2003-10	37571		
1999-11	62068	2003-11	41500		
1999-12	46241	2003-12	101357		

'Furniture' Export Data (in 000$) D36

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	14038	2000-01	45044	2004-01	122366
1996-02	14588	2000-02	43810	2004-02	99858
1996-03	22590	2000-03	50957	2004-03	150503
1996-04	17446	2000-04	55440	2004-04	155188
1996-05	19883	2000-05	59286	2004-05	148527
1996-06	19099	2000-06	49418	2004-06	112372
1996-07	18709	2000-07	46022	2004-07	140647
1996-08	18184	2000-08	43514	2004-08	144744
1996-09	22408	2000-09	56908	2004-09	165754
1996-10	28354	2000-10	59304	2004-10	178261
1996-11	29658	2000-11	66515	2004-11	177457
1996-12	24288	2000-12	54814	2004-12	175530
1997-01	20799	2001-01	50803	2005-01	153603
1997-02	17571	2001-02	53722	2005-02	152239
1997-03	25324	2001-03	56484	2005-03	182575
1997-04	20048	2001-04	63344	2005-04	192596
1997-05	29535	2001-05	68220	2005-05	188618
1997-06	20478	2001-06	52800	2005-06	176064
1997-07	15939	2001-07	46946	2005-07	161369
1997-08	19250	2001-08	56584	2005-08	188342
1997-09	30138	2001-09	66315	2005-09	232845
1997-10	34913	2001-10	73895	2005-10	210477
1997-11	35653	2001-11	72642	2005-11	203955
1997-12	30301	2001-12	57155	2005-12	195407
1998-01	29138	2002-01	64125	2006-01	125631
1998-02	24557	2002-02	58987	2006-02	174001
1998-03	30545	2002-03	72480	2006-03	196868
1998-04	25357	2002-04	80359	2006-04	166048
1998-05	32357	2002-05	83044	2006-05	169566
1998-06	39260	2002-06	62558		
1998-07	22662	2002-07	71166		
1998-08	25519	2002-08	76476		
1998-09	33772	2002-09	85770		
1998-10	38938	2002-10	102567		
1998-11	39401	2002-11	105576		
1998-12	37216	2002-12	81755		
1999-01	26765	2003-01	90775		
1999-02	35187	2003-02	70265		
1999-03	34487	2003-03	99609		
1999-04	37149	2003-04	101737		
1999-05	43277	2003-05	108267		
1999-06	38252	2003-06	101003		
1999-07	37117	2003-07	98044		
1999-08	31508	2003-08	110692		
1999-09	49093	2003-09	129805		
1999-10	44279	2003-10	157528		
1999-11	65687	2003-11	138146		
1999-12	44281	2003-12	108709		

'Furniture' Import Data (in 000$) D36

Source: Republic of Turkey, Prime Ministry Turkish Statistical Institute, http://www.tuik.gov.tr

Date	Value	Date	Value	Date	Value
1996-01	43261	2000-01	31610	2004-01	82311
1996-02	18446	2000-02	39129	2004-02	74834
1996-03	33910	2000-03	44962	2004-03	120395
1996-04	37495	2000-04	51745	2004-04	123572
1996-05	40454	2000-05	57264	2004-05	106472
1996-06	35884	2000-06	54380	2004-06	100950
1996-07	40756	2000-07	58363	2004-07	110113
1996-08	35933	2000-08	50118	2004-08	90375
1996-09	32930	2000-09	47705	2004-09	100487
1996-10	30705	2000-10	57358	2004-10	96794
1996-11	39100	2000-11	62461	2004-11	117293
1996-12	47457	2000-12	52476	2004-12	124833
1997-01	31173	2001-01	56189	2005-01	78559
1997-02	29357	2001-02	55455	2005-02	92484
1997-03	40417	2001-03	55469	2005-03	124318
1997-04	39342	2001-04	47502	2005-04	110438
1997-05	51401	2001-05	49750	2005-05	124174
1997-06	41578	2001-06	38312	2005-06	119199
1997-07	54148	2001-07	40494	2005-07	109878
1997-08	50897	2001-08	38022	2005-08	112379
1997-09	41161	2001-09	38380	2005-09	114479
1997-10	47571	2001-10	37770	2005-10	112263
1997-11	46832	2001-11	37404	2005-11	121865
1997-12	50526	2001-12	61172	2005-12	152271
1998-01	29467	2002-01	30828	2006-01	89181
1998-02	45212	2002-02	30260	2006-02	110382
1998-03	48961	2002-03	46180	2006-03	163001
1998-04	44594	2002-04	44185	2006-04	128878
1998-05	51674	2002-05	58412	2006-05	166680
1998-06	50821	2002-06	46764		
1998-07	52721	2002-07	64459		
1998-08	44044	2002-08	43862		
1998-09	39525	2002-09	72639		
1998-10	42459	2002-10	166100		
1998-11	46862	2002-11	75013		
1998-12	45083	2002-12	94668		
1999-01	20958	2003-01	60257		
1999-02	31563	2003-02	49006		
1999-03	37627	2003-03	70510		
1999-04	41636	2003-04	72599		
1999-05	41558	2003-05	85331		
1999-06	44098	2003-06	77910		
1999-07	40920	2003-07	69872		
1999-08	39984	2003-08	66116		
1999-09	37152	2003-09	118479		
1999-10	37002	2003-10	78630		
1999-11	44963	2003-11	94548		
1999-12	46532	2003-12	116976		