DEVALUATION AS A BALANCE OF PAYMENTS
CORRECTIVE MEASURE
IN TURKEY

A Thesis
Submitted to the Department of Management
and Graduate School of Business Administration
of Bilkent University
in Partial Fulfillment of the Requirements
for the Degree of

MASTER OF BUSINESS ADMINISTRATION

By
ZEYNEP ÖZTÜRK
FEBRUARY, 1990

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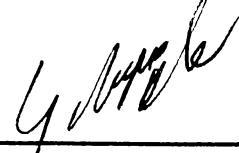In Partial Fullfillment of The Requirements

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By

Zeynep ÖZTÜRK

February, 1990

I certify that I have read this thesis and in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Business Administration.

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Assist. Prof. Gökhan Çapoğlu

I certify that I have read this thesis and in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Business Administration.

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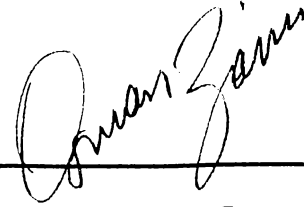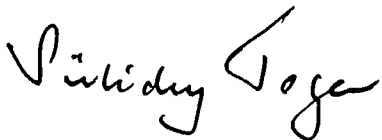
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ABSTRACT

DEVALUATION AS A BALANCE OF PAYMENTS CORRECTIVE MEASURE IN TURKEY

Zeynep ÖZTÜRK
MBA in Management
Supervisor: Assist. Prof. Gökhan Çapoğlu
February 1990, 45 Pages

The main purpose of this study is to examine emiprically whether or not devaluation could be relied upon as a means for correcting the balance of payments deficits in Turkey. The time period is the years between 1968-1984.

In this study, an international trade model for Turkey is established to find out price and income elasticities of import and export demands. Restricted form of Marshall-Lerner condition (Harberger condition) is applied to see the effectiveness of devaluation. Import and export demands functions are estimated by both Ordinary Least Square and Two Stage Least Square methods to see how Turkey's case fits into the methodological controversy. Another issue considered is the choice between static and dynamic formulations of the export and import functions.

It is found that import demand of Turkey is income elastic but price inelastic, whereas export demand for Turkey is elastic both with respect to the relative prices and income. Devaluation can be used as an effective tool in correcting the balance of payments in Turkey according to the study's findings.

Key words : Balance of payments, import demand, export demand, price elasticity, income elasticity, Marshall-Lerner condition, OLS, 2SLS, Cochrane Orcutt Type Least Square Estimation.

ÖZET

TÜRKİYE'NİN ÖDEMELER DENGESİNE DÜZELTİCİ TEDBİR OLARAK DEVELÜASYON

Zeynep ÖZTÜRK
Yüksek Lisans Tezi, İşletme Enstitüsü
Tez Yöneticisi : Yrd. Doç. Gökhan Çapoğlu
Şubat 1990, 45 Sayfa

Bu çalışmanın temel amacı amprik olarak develüasyonun Türkiye'nin ödemeler dengesi için düzeltici bir tedbir olup olmadığını araştırmaktır. İncelenen dönem 1968-1984 zaman aralığıdır.

Bu çalışmada ithalat ve ihracat taleplerinin gelir ve fiyat esnekliklerini tahmin etmek için Türkiye'nin uluslararası ticaret modeli kurulmuştur. Develüasyon'un etkinliğini anlamak için Marshall-Lerner şartının kısıtlanmış şekli (Harberger şartı) uygulanmıştır. Methodsal tartışmaların Türkiye'nin dış ticaret modeline nasıl uyduğunu anlamak için ithalat ve ihracat fonksiyonları hem Adi En Küçük Kareler, hem de İki Aşamalı En Küçük Kareler yöntemleriyle tahmin edilmiştir. Dikkate alınan diğer bir konuda ihracat ve ithalat fonksiyonlarının statik ve dinamik formulasyonları arasında seçim yapmaktır.

Türkiye'nin ithalat talebinin gelire karşı esnek, fiyata karşı esnek olmadığı, ihracat talebinin ise hem gelire hem de fiyata karşı esnek olduğu bulunmuştur. Çalışmanın bulgularına göre develüasyon Türkiye'nin ödemeler dengesini düzeltmekte etkili bir araçtır.

Anahtar Sözcükler: Ödemeler dengesi, ithalat talebi, ihracat talebi, fiyat esnekliği, gelir esnekliği, Marshall-Lerner şartı, AKK, 2AEKK, Cochrane Orcutt Tipi En Küçük Kareler Tahmini

ACKNOWLEDGEMENTS

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1. INTRODUCTION

1.1. The Problem Statement

The deficits in balance of payments (BOP) have always been a problem for the Turkish economy. Hence, reducing the BOP deficits has been one of the main policy objectives for governments. However the deficit increased exponentionally during the sixties and seventies, and it was more than four billion dollars at the beginning of the eigthies.

Terms of trade (TOT), the ratio of export prices to import prices, showed declining trend during the planned period. Between 1960-1978, TOT deteriorated at an average of 1.4 percent annually. However drastic deterioration in TOT appeared after 1979. This was not only due to an increase in petrol prices but also unfavorable developments in exports of agricultural products after 1979 . Although the quantity of agricultural product exported increased export revenue decreased (Kazgan, 1985:434).

Investment and intermediate goods consisted 95 percent of imports. Especially the rise in the oil prices during the seventies led to incease in the shares of intermediate goods and raw materials. On the other hand, Turkey's exports consisted of agricultural products and the share of industrial products did not change despite many incentives were offered (Kepenek, 1986:355).

The economic structure of Turkey which was based on the import substitution policies led to the depression of the economy in the middle of the 1970's. There was a decrease in foreign exchange reserves and an increase in inflation. Government took some stabilization measures in 1978. Devaluation of Turkish lira was one of them. This policy improved the BOP deficit relatively, it declined to 2310.8 million dollars which was the 50 percent of the 1977's trade deficit.

Continuous depression of the economy resulted in the application of the new economic policies in January 1980. This new economic program based on the liberation of the domestic market, and the export orientation in foreign trade.

In the fifth five years development plan, it was stated that the BOP was the most important area in which the foreign outward open development policy reflected. Export sector was given importance to improve the BOP. To increase the volume of exports, some measures were taken such as devaluation of TL, export subsidies and incentives. During the application of these policies, the value of TL with respect to US dollars was reduced at a ratio of 48-60 percent. After January 1981, the value of TL was being adjusted daily.

Foreign trade noted spectacular development along with the 1980 economic stability measures and with outward orientations.

Turkey's foreign trade volume rose from $7.3 billion in 1979 to $19.3 billion in 1985. The balance of trade deficit standing at $3.4 billions as of the end of 1985, rose only by 20 percent when compared with 1979. The most important development in exports was the significant shift to industrial products, their share in overall exports rose to 75.3 percent in 1985 (Economic report, 1986:125).

This study estimates the price and income elasticities of import demand of and export demand for Turkey, and tests the hypothesis whether or not the devaluation could be relied upon as a means of correcting the BOP deficits in Turkey.

1.2. The Methodology of Study

The present study is an investigation into the export and import demand elasticities for Turkey. The major consideration is to test the hypothesis about effectiveness of the devaluation as a policy tool in correcting the BOP deficits.

To test the hypothesis, the import and the export functions for Turkey are established. These functions are stated both in equilibrium and in disequilibrium forms. The restricted form of Marshall-Lerner condition is applied to see whether the devaluation improves the BOP deficits in Turkey[1].

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(1) Harberger condition

$$\frac{M}{X} n_m + n_x > 1 + m$$

where M = Imports; X = Exports; m = marginal propensity of import; n_x=price elasticity of export; n_m=price elasticity of import

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This study uses Ordinary Least Square (OLS) and Two Stage Least Square (2SLS) methods to see how Turkey's case fits into the methodological controversy. The time period covered is the years between 1968 and 1984.

1.3. Some Considerations about Data :

1.3.1. The Time Period Covered

The years between 1968 and 1984 are covered in this study, on an annual basis. We do not take the years before 1970 because of the existence of similar study done by M. Khan for the years 1951-1969. The years after 1984 are not taken because of some missing data. For Turkey price and quantity indices for imports and exports have not been calculated after 1984. So the time period of the study is limited by 1984.

1.3.2. Quantity of Exports and Imports

The volume index of export is taken from International Financial Statistics (IFS). The words volume and quantity are used interchangable to refer to the physical amount of goods measured by the units or aggregated by the use of index numbers.

Th export quantity index is calculated according to Paacshe quantity index formula of

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$$\frac{\Sigma \, p_n q_n}{\Sigma \, p_n q_0}$$

where n refers to the current year price and quantity, while 0 refers to the base year (1980) quantity.

The volume index for imports is determined by dividing TL value of imports to unit value of imports specified in terms of TL. This can be indicated as,

$$\frac{\Sigma \, p_n q_n}{p_m}$$

Foreign trade data resources are the "custom enterance and exit decleration" presented to the custom administration by importers and exporters in accordance with the customs law. Foreign trade statistics are mainly based on special trade system and include imports, imports with waiver, and exports, exclude certain commodities in non-trade status or legally restricted ones.

1.3.3. Unit Value of Imports and Exports :

These are the unit value indices calculated according to Laaspayres price index formula of

$$\frac{\Sigma P_n q_0}{\Sigma P_0 q_0}$$

where n refers to the current year prices and O refers to the base year (1980) price and quantity. The unit value for imports is specified in terms of TL, considering TL value of imports is interested by Turkish importers. The unit value for exports is determined in terms of US dollars, considering the export demand is according to the dollar value of Turkey's export. The source of these data is IFS.

1.3.4. Consumer Price Index of Turkey :

Consumer Price Indices are the most frequently used indicators of inflation and reflect the changes in the cost of acquiring a fixed basket of goods and services by the average customer.

It was obtained in terms of TL from IFS year books and converted into the US dollar value by using the official exchange rate. Base year for this index is taken as 1980 average.

1.3.5. Gross National Product of Turkey :

Real GNP data in terms of 1980 average was taken from the IFS year books. It was converted into the US dollar value by using the

official exchange rate from IFS year books.

1.3.6. OECD Consumer Price Index :

Since OECD countries took great part in Turkish foreign trade during the time period of this study, OECD consumer price index was used in place of world price index level. As the index was available with different base years in OECD Main Economic indicators, it was converted into a common base (1980).

1.3.7. OECD Gross Domestic Product (GDP)

OECD total real GDP was used for the world income level. Since the index was obtained with different base years, it was converted into a common base of 1980. This data was collected from OECD Main Economic Indicator year books.

2. Literature Review :

Orcutt (1950) discussed the effectiveness of the depreciation in improving the trade balance . He attempted to prove that the estimated price elasticities until that time were unreliable for such a proof. Since they were lower than expected.

Harberger (1958) made general survey of econometric works in the international trade area. His main attention was on the studies related to the price mechanism. The result of survey indicated that there was a powerfull price mechanism in the international trade. He also concluded that long run elasticities of the export demand were greater than two for typical countries.

Ball and Mavwah (1962) estimated the series of import demand functions for United States based on quarterly data from 1948-1958. Estimates were made for the six groups of imported goods. Single equation least square technique was used. The result of this study was consistent with the hypothesis that the US imports was elastic both with respect to the relative prices and output. He concluded that the time series analysis could be used reliably in the estimation of international trade models.

Dutta (1964) constructed a foreign sector model for India. His model consisted of six equations and one identity. Two of these equations were related to imports and four of them were the export

equations. Payment balance was shown in identity. Imports were separated as merchandise and service imports. Exports were grouped according to dollar, sterling, OECD and remaining world areas.

In import demand functions, industrial output index was used as a proxy for income. Other explanatory variables were price, time trend, lagged imports and index of trade barriers. Exports were determined as a function of industrial output, relative prices, time trend and export promotion index. In most of the cases he found relative price coefficient as insignificant.

Turnovsky (1968), estimated annual aggregate import and export demand functions for New Zeland, for the years between 1947-1963. He aimed at finding out international trade relationship for a small country.

He considered the relationship between imports and exports in terms of stock flow model. Import demand was written as a function of the real private disposable income, the relative prices of imports, the level of overseas assets lagged, the supply of New Zeland exports lagged and the stock of imports in existence at the end of preceeding year. For supply equation explanatory variables were the foreign exchange available, the lagged exports and the level of production abroad. The export equation was determined as a function of relative prices, income and net stocks.

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He used both simultaneous and single equation techniques (OLS, 3PLS, 2SLS) to estimate import demand functions. He concluded that OLS was valid procedure for estimating the import demand functions for a small country. He found that import demand was more sensitive to income, but export demand was more sensitive to price in New Zeland. Also he indicated an adverse long run effect of devaluation for this country.

Hauthakker and Magee (1969) estimated the demand elasticities for both imports and exports with respect to the income and price for some countries, most of them were developed. They also made more detailed study for US.

Import and export equations were the function of relative prices and income in loglinear form. They used OLS method considering the failure of simultaneous equation techniques in this area. Observation period was the years between 1951-1966, on an annual basis.

They concluded that disparities in the income elasticities of import demand caused secular improvement or deterioration in the trade balance, eventhough all countries grew and inflated at the same rate. Another conclusion of their study was that US had the same income elasticity for demand of import like the other developed countries but the other countries export demand for US was abnormally low. They also indicated the reliability of

traditional least square method.

Khan (1974) made a study to provide estimation of import and export demand functions for fifteen developing countries, one of them was Turkey. His aim was to test the effect of price changes on the trade flows of these countries for the period of 1951-1969.

Import and export demands were determined as a function of relative price level and income. Unit value, price level and income were explanatory variables for the export and import supply equations. He substituted OECD price and income level in the place of world income and price level. Equations were in double log form. Both equilibrium and disequilibrium cases were estimated by using 2SLS method.

It was found that the simple equation results were adequate. The price elasticities of exports and imports were found greater than expected whereas the income elasticities were low. For many cases, the coefficient of autocorrelation was significant and this was accepted as an indicator of omission of quantitative restrictions. He concluded that prices played an important role in the determination of imports and exports of developing countries and Marshall-Lerner condition was satisfied in these countries.

Ghartey (1987) examined whether or not the devaluation could be means in correcting the BOP deficits in Ghana. His export and import

demand equations were similar to Khan. He estimated both static and dynamic cases for exports and imports by OLS and 2SLS methods.

The OLS results were best. Price elasticity for import demand was fairly high but it was low for export demand. Income elasticities were greater than unity for both export and import demands. His basic conclusion was that the devaluation can be used in Ghana to correct BOP deficits but it must be applied frequently with smaller percentage changes and with other appropriate policy instruments.

Tansel and Togan (1987) examined the behaviour of import and export demands of Turkey at an aggregate level. They aimed to analyse the simultaneity problems and to make a choice between static and dynamic formulations.

The export and import demands were specified as an increasing function of the level of real income in the importing region and as a decreasing function of the relative price of the imported goods own price to the price of domestic substitutes. Export supply equation was written as a function of the ratio of export prices to domestic prices in terms of TL, and domestic income. Import and export demands were specified in terms of TL and US $ respectively. The time period covered was 1960-1985.

They treated import prices as exogenous, accepting infinitely elastic supply curve, and used OLS method to estimate import function. They also estimated the import function in terms of growth rate. Their estimation in log static and dynamic form indicated the serial correlation. In the dynamic growth rate model one period lagged import rate were insignificant. The best result was obtained from the static growth rate.

OLS result of export demand function for log static, log dynamic, and dynamic growth rate models did not indicate good result considering parameter constancy, and autocorrelation. So simultaneous estimation was done. The best result was obtained from the static model in growth rates.

The present study differs from the previous studies in two respects. The first is the time period covered. Khan did similar study for the years between 1951 and 1969, however the covered period is between 1968 and 1984 in this study. The second is the estimation method. Khan used only 2SLS, and Tansel and Togan used only OLS for the estimation of the import function. However this study estimates import and export functions both with OLS and 2SLS.

3. RESEARCH METHODOLOGY :

3.1. The Model :

3.1.1. Import Function :

The most widely used formulation for the import demand function is that the quantity of imports demanded is explained by the ratio of import prices to domestic price level and domestic real income [1]. The *equilibrium* state of the import function can be written in double logarithm form as follows;

$$\ln M_t^d = B_0 + B_1 \ln (PM_t/PD_t) + B_2 \ln Y_t + u_t^d \qquad 1$$

$$\ln M_t^s = b_0 + b_1 \ln PM_t + b_2 \ln P_{wt} + b_3 \ln Y_{wt} + u_t^s \qquad 2$$

$$\ln M_t^d = \ln M_t^s \qquad 3$$

where

M   = quantity of imports of Turkey

PM = unit value of imports of Turkey

PD = domestic price level of Turkey

Y   = real gross national product of Turkey

P_w= world (OECD) price level

Y_w= world (OECD) income level

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1. See Hauthakker and Magee (1969), Khan (1974), Ghartey (1985)

U is a stochastic error term and superscripts d and s refer to demand and supply respectively.

The import demand equation specifies that the quantity demanded is the loglinear function of the ratio of import prices to domestic price level, assuming a degree of substitutability between imported and domestic goods, the domestic income and the additive stochastic disturbance term. Because of the logarithmic specification, the parameters B_1 and B_2 are the price and income elasticities respectively. According to the theory negative sign for B_1 and positive or negative sign for B_2 are expected. The latter is the result of whether the import good is regarded as a normal or an inferior good. Import supply is given as a loglinear function of import price, world price level, world real income and stochastic disturbance term. The last equation is equilibrium condition.

In this system there are three endogenous variables, PM, M^d, M^s, and four exogenous variables, PD, P_w, Y, Y_w. In equation (1), the number of excluded predetermined variables (P_w and Y_w) are greater than the number of the endogenous variables (PM) on the right hand side , so it is overidentified. Equation (1) can be estimated by OLS and by 2SLS using PD, Y, P_w and Y_w as instrumental variables. One must also consider the linear constraint that B_1 is the same for PM and PD.

In the OLS estimation all values of import demand equation are specified in terms of TL. This indicates that the importers response according to the TL value of outpayment. However in the 2SLS estimation, since we have to consider the supply side, the determination is done in terms of US $. Volume of import in millon of US $ is regressed on a real GNP of Turkey in terms of TL and the relative prices in terms of $. Relative prices must be expressed in a common currency unit because of the adjustment for the foreign exchange rate changes.

Introducing the lagged values of imports and import price leads to the dynamic form of the import demand and supply equations. *Dynamic* form can be written as follows;

$$\ln M_t^d = \delta_0 + \delta_1 \ln (PM_t/PD_t) + \delta_2 \ln Y_t + \delta_3 \ln M_{t-1} + v_t^d \qquad 4$$

$$\ln M_t^s = g_0 + g_1 \ln P_{wt} + g_2 \ln PM_t + g_3 \ln Y_{wt} + g_4 \ln PM_{t-1} + v_t^s \qquad 5$$

$$\ln M_t^d = \ln M_t^s \qquad 6$$

Equilibrium relationship implies instantaneous adjustment by the importers to the changes in the relative price of imports and real income. However there may be costs in adjustment of actual imports to desired imports, or imports may be tied to the contracts extended over a period of time. So these result in probable delayed response. So to test the possible incorrect specification results

from the estimation of equilibrium relationship when true relationship is a disequilibrium; import function is determined in the content of partial adjustment mechanism, in which the changes in imports are related to the difference between the demand for imports in period t and the actual level of imports in the previous period.

In this system the endogenous variables are the same with the previous case but the two more predetermined variables are added, PM_{t-1}, M_{t-1}. v^d and v^s are the stochastic error terms of the demand and supply equations respectively.

Since the number of excluded predetermined variables (3) is greater than the number of included endogenous variables (1) at the right hand side of equation (4), it is overidentified. Equation (4), therefore, can be estimated by 2SLS. It is also estimated by OLS.

3.1.2. Export Function :

The *equilibrium* case demand and supply model of Turkey's exports is specified as follows ;

$$\ln X_t^d = \alpha_0 + \alpha_1 \ln (PX_t/P_{wt}) + \alpha_2 \ln Y_{wt} + u^d \qquad 7$$

$$\ln X_t^s = a_0 + a_1 \ln PX_t + a_2 \ln PD_t + a_3 \ln Y_t + u^s \qquad 8$$

$$\ln X_t^d = \ln X_t^s \qquad 9$$

where

      X = quantity of exports of Turkey

      PX= unit value of exports of Turkey

The other variables are as explained in import demand function.

Export demand is specified as a function of the ratio of export prices to the world price level, indicating substitution between exported goods and foreign goods, the world income, and the additive stochastic disturbance term. The parameters α_1 and α_2 are the price and income elasticities respectively. The sign of α_1 is expected negative , whereas the sign of α_2 is expected positive or negative depending on whether the export good is seen as a normal or an inferior good. The export supply equation is specified as a loglinear function of the export prices, the domestic price and income level and the stochastic disturbance term. The last equation is equilibrium condition.

Export demand equation can be estimated by OLS and 2SLS methods. When we determine model simultaneously, we take PX, X^d and X^S as endogenous and PD, P_W, Y, Y_W as exogenous variables. Equation (7) is overidentified , since the number of excluded predetermined variables (PD, Y) is greater than the number of endogenous variables (PX) at the right hand side. Equation (7) is

estimated by 2SLS using PD, P_w, Y and Y_w as instrumental variables; considering the linear constraint of α_1 is being both export and domestic price elasticity. All the values in the export demand and supply equations are written in terms of US $.

The *dynamic* form export function is determined as follows;

$$\ln X_t^d = \theta_0 + \theta_1 \ln (PX_t/P_{wt}) + \theta_2 \ln Y_{wt} + \theta_3 \ln X_{t-1} + v_t^d \qquad 10$$

$$\ln X_t^s = d_0 + d_1 \ln PD_t + d_2 \ln Y_t + d_3 \ln PX_t + d_4 \ln PX_{t-1} + v_t^s \qquad 11$$

$$\ln X_t^d = \ln X_t^s \qquad 12$$

As in the case of import function, there is an adjustment function. This function relates the change in exports to the difference between demand for exports in this period t and actual exports in the previous period to overcome the possible misspecifaction due to the equilibrium.

X_{t-1} and PX_{t-1} are the lagged value of exports and unit value of exports respectively. Dynamic export demand is determined as the equilibrium case except the lagged value of exports is added to the right hand side. Also in the supply equation the lagged value of export price index is added as an explanatory variable.

The three endogenous variables are PX, X^d, X^s, while the six predetermined variables in the model are P_w, PD, Y, Y_w, X_{t-1}, and PX_{t-1}. Equation (10) is overidentified and can be estimated by 2SLS. This equation is also estimated by OLS.

3.2. Methodology of Estimation:

In the international trade area export and import demand relationships are determined mostly in linear and loglinear form. Linear specification is used if the primary aim is forecasting (Khan and Rose, 1977:150). However loglinear form performs superior fit and provides easy interpretation, therefore it is prefered to linear form. Loglinear specification provides the constant elasticities, that means it prevents the change in the elasticity as the dependent variable changes. In this way we avoid the problem of drastic falls in price elasticity as imports or exports rise. Also loglinear specification allows the dependent variable to react proportionally to a rise or fall in the explanatory variables (Italianer, 1986:21).

Import and export demand equations can be estimated by using OLS method. However, unless we assume that supply price elasticities are infinite or at least large, so that price of import can be treated as exogenous, there is possibility of obtaining biased and inconsistent elasticity estimates (Khan, 1975:680).

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Simultaneous relationship between price and quantity can be described by introducing the supply function and inconsistency can be removed by using simultaneous equation techniques like 2SLS.

Omission of the role of quantitative restrictions on imports and exports can lead to misspecification in the estimation. Correlation between quantitative restrictions and either of the explanatory variables causes the estimated elasticities to be biased and inconsistent. Even this does not occur, if there is a serial correlation in restrictions then the error terms will not be independent. So the coefficient of autocorrelation can be considered as an indicator of restrictions. A first order autoregressive process for the error terms can be specified as;

$$u_t = \rho_1 u_{t-1} + \varepsilon_{1t}$$
$$\delta u_t = \rho_2 (\delta u_{t-1}) + \varepsilon_{2t}$$
$$|\rho_1| < 1 \; ; |\rho_2| < 1$$

where

$$\varepsilon_{it} \approx ND(0, \sigma_d^2) \quad i = 1, 2$$

Adjustment for autocorrelation, therefore, will correct for bias in the coefficients and their standard errors (Khan, 1974:683).

In the case of a serial correlation, we must do reestimations of these equations using the first order Cochrane-Orcutt iterative

technique. This particular method could be used conveniently as an option in the regression program used.

In Cochrane estimation we set

$$u_t = \rho u_{t-1} + e_t$$

where the u's are the errors from the tranformed estimating equations . Both dependent (e.g. M) and independent variables in the transformed equations can be written as $M_t - \rho M_{t-1}$. The equation above and the transformed equation are estimated alternatively until successive values of ρ differ by no more than 0.001 (Hauthakker & Magee, 1969:124).

3.3. Findings of Study :

3.3.1 Import Function :

The OLS and 2SLS results for equilibrium import demand are presented in table 1.a. and 1.b. respectively.

OLS results indicate that the regression coefficients of price and income are significant at 5 % and 1 % significance levels. They have expected signs. R_x determinant indicates that there is serious multicollinearity between explanatory variables. Besides DW statistics and Geary test at 1% and 5% levels show that there is a

serial correlation in the model.

So the model is estimated again by using Cochrane-Orcutt type procedure. Results of this estimation are shown in table 2. We see that the estimated price and income coefficients are significant at 1% and 5% levels, and they have expected signs. The R^2 is 0.8650, indicating moderate fit of the model. This shows that about 87% of variation in import demand is explained by the relative price and domestic income variations.

The result of F test shows that model is significant as a whole at 5 % and 1 % levels for this estimation. The R_x determinant approaches to one, therefore there is no serious multicollinearity. DW statistics is greater than the upper critical bounds of d test. So this indicates that there is no autocorrelation. Geary test result also agrees with the DW statistics.

2SLS results of the estimated coefficients show that they have expected signs, however price coefficient is insignificant at 5 % level. R^2 in the case of simultaneous estimation does not show fitness of equation, because it is bounded with $(-\infty, 1)$, not $(0, 1)$. R^2 between observed and predicted gives more accurate result for the fitness of the model, and it is 0.7436. DW statistics and geary test show that there is autocorrelation at 5% and 1% levels. R_x determinant shows no multicollinearity.

TABLE 1.a OLS Result of Equilibrium Import Demand Function

R-square	=	0.8009
Variance of estimate=		0.034501
F	=	28.152
DW	=	0.846

Analysis of variance

explained	1.9426
unexplained	0.48302
total	2.4256

variable name	Estimated coefficient	standard error	t-ratio 12 df
lprt	-0.49004	0.18176	-2.6961
lydt	1.9751	0.30682	6.4373
intercept	-14.656	2.60216	-5.6335

varience -covarience matrix of coefficients

lprt	0.03304		
lydt	-0.04393	0.09414	
int	0.3786	-0.7979	0.6769
	lprt	lydt	int

correlation matrix of coefficients

lprt	1		
ywt	-0.78776	1	
int	0.80073	-0.99962	1
	lprt	ydt	

TABLE 1.b 2SLS Result of Equilibrium Import Demand Function

R-square bet. o&p =	0.7436
Variance of estimate=	0.037807
F =	
DW =	0.7384

Analysis of variance

explained	1.5349
unexplained	0.5293
total	2.0642

variable name	Estimated coefficient	standard error	t-ratio 12 df
lprt	-0.273	0.19542	-1.3969
lydt	1.5685	0.30944	5.0688
intercept	-7.1968	2.0137	-3.574

varience -covarience matrix of coefficients

	lprt	lydt	int
lprt	0.03819		
lydt	-0.0465	0.09575	
int	0.2307	-0.6035	0.4055

correlation matrix of coefficients

	lprt	ydt	
lprt	1		
ywt	-0.7689	1	
int	0.58619	-0.9685	1

TABLE 2 Result of Least Square Estimation by Cochrane-Orcutt
Type Procedure of Equilibrium Import Demand Function

R-square	=	0.865
Variance of estimate=		0.023392
F	=	
DW	=	1.7088

Analysis of variance

explained	2.0981
unexplained	0.32749
total	2.4256

variable name	Estimated coefficient	standard error	t-ratio 12 df
lprt	-0.47483	0.17086	-2.779
lydt	2.0146	0.37351	5.3938
intercept	-14.963	3.1297	-4.781

varience -covarience matrix of coefficients

lprt	0.02919		
lydt	-0.03928	0.1395	
int	0.3381	-0.01168	0.9795
	lprt	lydt	int

correlation matrix of coefficients

lprt	1		
ywt	-0.61555	1	
int	0.6322	-0.99942	1
	lprt	ydt	

So it is clear that least square estimation by Cochrane-Orcutt type procedure performs well in estimating equilibrium import demand, however 2SLS result does not perform as well.

The results for dynamic case of import function, estimated by both OLS and 2SLS, are shown in table 3.a. and 3.b. respectively.

Although regression coefficients for price and income have the expected signs, they are both insignificant at 5 % level in both OLS and 2SLS estimations. Also lagged value of imports is insignificant at this level. As we look at the correlation matrix, it is apparent that there is a high correlation between explanatory variables. The high R^2 and insignificant explanotary variables also indicate this. The h test illustrates that there is negative autocorrelation. We can conclude that the dynamic model is not suitable for estimating the import demand function for Turkey.

So based on the least square estimation by Cocharane-Orcutt iterative technique, the estimated import demand equation is written as;

$$\ln M_t = -14.963 - 0.47483 \ln \left(\frac{PM_t}{PD_t}\right) + 2.0146 \ln YD_t$$

$$(3.1297) \quad (0.17086) \qquad (0.37351)$$

TABLE 3.a. OLS Result of Dynamic Import Demand Function

R-square	=		0.7651
Variance of estimate=			0.039325
F	=		13.029
DW	=		1.0217

Analysis of variance

explained	1.5371
unexplained	0.47189
total	2.009

variable name	Estimated coefficient	standard error	t-ratio 12 df
lprt	-0.37489	0.29203	-1.2836
lydt	1.5313	0.89645	1.7082
lmt1	0.19742	0.37569	0.52549
intercept	-11.294	6.9051	-1.5356

varience -covarience matrix of coefficients

	lprt	lydt	lmt1	int
lprt	0.08528			
lydt	-0.2311	0.8036		
lmt1	0.08194	-0.3104	0.1411	
int	1.801	-0.6184	0.2346	0.4768

correlation matrix of coefficients

	lprt	lydt	lmt1	int
lprt	1			
lydt	-0.88275	1		
lmt1	0.7469	-0.92154	1	
int	0.8929	-0.99905	0.90429	1

TABLE 3.b. 2SLS Result of Dynamic Import Demand Function

R-square bet. o&p	=	0.7731
Variance of estimate=		0.032695
F	=	
DW	=	0.9749

Analysis of variance

explained	1.3367
unexplained	0.39234
total	1.729

variable name	Estimated coefficient	standard error	t-ratio 12 df
lprt	-0.070665	0.2419	-0.29213
lydt	0.59385	0.70942	0.8371
lmt1	0.567589	0.35054	1.6192
intercept	-2.5648	3.6483	-0.70301

varience -covarience matrix of coefficients

	lprt	lydt	lmt1	int
lprt	0.05851			
lydt	-0.1442	0.5033		
lmt1	0.05857	-0.2262	0.1299	
int	0.6868	-0.2539	0.1069	0.1331

correlation matrix of coefficients

	lprt	lydt	lmt1	int
lprt	1			
lydt	-0.84022	1		
lmt1	0.69076	-0.90946	1	
int	0.77825	-0.98105	0.83581	1

3.3.2. Export Fuction :

Table 4.a. and 4.b. indicate results of the equilibrium export demand function estimated by OLS and 2SLS respectively.

Regression coefficients of price and income are both significant individually at 5 % and 1 % significance levels. The parameter estimators for the price and income have the expected signs from the theory.

R^2 is 0.8848 for OLS. This result shows that the OLS estimation of demand equation for Turkey's exports yields a well fit. This means almost 89 percent of variation in export demand for Turkey is explained by variations in the relative prices and world income level. As explained earlier R^2 is not well indicator of fitness for 2SLS estimations. R^2 between observed and predicted is 0.8848.

Since calculated F value is greater than the table F value, the model is significant as a whole at 5% and 1% significance levels for OLS estimations. There is no correlation between explanatory variables, since R_x determinant approaches to one. This indicates that there is no serious multicollinearity in the models estimated by OLS and 2SLS.

The DW statistics also permits us to reject any hypothesis of autocorrelated error terms at 5% and 1% significance level. Since

TABLE 4.a. OLS Result of Equilibrium Export Demand Function

R-square	=	0.8848
Variance of estimate=		0.01347
F	=	53.788
DW	=	1.7918

Analysis of variance

explained	1.4491
unexplained	0.18858
total	1.6377

variable name	Estimated coefficient	standard error	t-ratio 12 df
lprt	-1.006	0.1689	-5.9879
lywt	1.3689	0.203	6.7434
intercept	-7.4798	1.7806	-4.2008

varience -covarience matrix of coefficients

	lprt	lywt	int
lprt	0.02823		
lywt	0.008357	0.04121	
int	-0.06822	-0.9394	0.317

correlation matrix of coefficients

	lprt	lywt	int
lprt	1		
ywt	0.24504	1	
int	-0.22803	-0.99972	1

TABLE 4.b.2SLS Result of Equilibrium Export Demand Function

R-square bet. O&p = 0.8848
Variance of estimate= 0.01347
F =
DW = 1.7918

Analysis of variance

explained	1.449
unexplained	0.18861
total	1.6377

variable name	Estimated coefficient	standard error	t-ratio 12 df
lprt	-1.0134	0.19356	-5.2358
lywt	1.3667	0.20499	6.667
intercept	-7.426	1.7958	-4.1553

varience -covarience matrix of coefficients

lprt	0.03746		
lywt	0.01109	0.4202	
int	-0.9054	-0.368	0.3225
	lprt	lywt	int

correlation matrix of coefficients

lprt	1		
ywt	0.27954	1	
int	-0.26048	-0.99968	1
	lprt	lywt	

calculated d is greater than the upper critical bound for positive autocorrelation. Also geary test gives the same result.

The closeness of OLS and 2SLS results indicates that there is no simultaneity bias in OLS estimation for Turkey's export demand. Both methods are reliable in measuring elasticities.

Dynamic case results are given in table 5.a. and 5.b. Only income and price terms are significant individually at 5 % significance level and have the expected signs. Lagged export value is found insignificant for both OLS and 2SLS estimations.

R^2 is 0.8811 and R^2 between observed and predicted is 0.8810 for OLS and 2SLS estimations. F test shows that the models are significant as a whole at 5% and 1% levels. So the significance of the models as whole but insignificant lagged export values are the indication of serious multicollinearity. The h test indicates that there is no autocorrelation for both OLS and 2SLS estimations. Although the models are significant as a whole and there is no serial correlation, insignificance of the lagged export value and existence of multicollinearity indicate that dynamic case does not well explain export demand function.

Consequently considering the closeness of OLS and 2SLS results we can take the result of OLS estimation as the explanation of export demand function for Turkey. The found equation is;

TABLE 5.a. OLS Result of Dynamic Export Demand Function

R-square	=	0.8811
Variance of estimate=		0.015125
F	=	29.651
DW	=	1.9589

Analysis of variance

explained	1.3454
unexplained	0.8115
total	1.5269

variable name	Estimated coefficient	standard error	t-ratio 12 df
lprt	-0.93881	0.22962	-4.0886
lywt	1.3277	0.36914	3.5967
lxt1	0.085209	0.21876	0.3895
intercept	-7.5099	2.5858	-2.9034

varience -covarience matrix of coefficients

	lprt	lywt	lxt1	int
lprt	0.05272			
lywt	-0.02787	0.1363		
lxt1	0.03142	-0.6036	0.4786	
int	0.1076	-0.9226	0.3125	0.6686

correlation matrix of coefficients

	lprt	lywt	lxt1	int
lprt	1			
ywt	-0.32884	1		
lxt1	0.62544	-0.74742	1	
int	0.18124	-0.96655	0.55241	1

TABLE 5.b. 2SLS Result of Dynamic Export Demand Function

R-square bet. o&p   =   0.881
Variance of estimate=   0.015148
F   =
DW   =   1.9244

Analysis of variance

explained	1.3451
unexplained	0.1877
total	1.5269

variable name	Estimated coefficient	standard error	t-ratio 12 df
lprt	-0.96963	0.25905	-3.7431
lywt	1.3434	0.37479	3.586
lxt1	0.066842	0.23023	0.2932
intercept	-7.5728	2.5992	-2.9135

varience -covarience matrix of coefficients

lprt	0.06711			
lywt	-0.03548	0.1405		
lxt1	0.03999	-0.6495	0.05301	
int	0.137	-0.9394	0.3303	0.6756
	lprt	lywt	lxt1	int

correlation matrix of coefficients

lprt	1			
ywt	-0.3654	1		
lxt1	0.67045	-0.75274	1	
int	0.20341	-0.96433	0.55203	1

$$\ln X_t^d = -7.4798 - 1.0060 \ln \left(\frac{PX_t}{P_{wt}}\right) + 1.3689 \ln Y_{wt}$$

(1.7806)   (0.16801)   (0.20300)

3.3.3 Elasticities :

Table 6: Equilibrium Elasticities of Import and Export Demand

Parameters	Imports	Exports
Price	.47483	1.0060
Income	2.0146	1.3689

From table 6, the aggregate price and income elasticities for import demand is .0.47483 and 2.0146 respectively. This results disagree with Khan's results but agrees with Tansel and Togan's findings.

This low price elasticity means if import prices increase, import demand will fall less than this increase. This shows that the relative prices have no significant effect on Turkey's imports. So one can not expect improvement in the BOP as a result of devaluation. As a developing country, Turkey is expected to have inelastic price elasticity, considering the composition of imported goods. Turkey's imports consists mostly of raw materials and intermediate goods which have inelastic demands. Our results seems to reflect the import structure of the country.

In the developing countries the income elasticity of import demand is usually greater than the income elasticity of their export demand. The result of our study is consistent with this fact. The income elasticity of demand for imports is greater than unity. Since Turkey is in growth process, she needs more investment to increase income level of the country. In other words, she has high marginal capital/output ratio. In order to create one additional unit income, she must increase her investment more than one unit. This means an increase in imports of capital goods as income grows.

The results of this study show that 1% increase in income will lead to 2.14% increase in import demand. So this will lead to the trade deficit expectation in the case of income growth. In addition, the income elasticity of exports is less than the income elasticity of imports . So if the growth rate in Turkey is in line with the rest of the world and prices remain the same, trade balance turns unfavor of Turkey (Johnson, 1958:chp 4).

The estimated price and income elasticities of export demand for Turkey are 1.006 and 1.3689 respectively. This result is similiar to Khan's, and Tansel and Togan's findings in respect to be greater than unity.

Since Turkey faces with the price elastic export demand, price variations will effect the export demand. If export prices increase

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one percent, this will lead to decrease in quantity demanded slightly more than one percent.

Turkey is mostly primary commodity exporter. The great part of her exports is made up of agricultural products like hazelnut, cereals, cotton, tobacco, orange etc. , and agricultural products have inelastic demand in nature. However our results indicate that she has elastic demand. This may result from that Turkey supplies only part of the particular commodities in the world trade. Although primary commodities have inelastic demand, if a country supply only small part of these, then she can face with elastic demand curve. If this country makes devaluation, importers will buy from her (Wells, 1973:182). Also, we can add that the share of the manufactured goods in exports increased from 36 percent to 72.1 percent and the share of the agricultured goods in exports deceased from 57.4 percent to 24.5 between 1980 and 1984. So the changing composition of the export goods from inelastic agricultural products to elastic manufactured products may also result in the elastic demand for Turkey's exports.

The income elasticity for Turkey's exports is greater than unity. This means if the income in the rest of the world increases by one percent this will lead to 1.3689 percent increase in export demand for Turkey other things being equal.

The long run price and income elasticities for export and import

demands can be calculated from the dynamic form as follows;

$$\frac{\text{Price/Income elasticity}}{\begin{array}{c}\text{1- Lagged export/Import}\\ \text{elasticity}\end{array}}$$

Table 7. Long run Estimates of The Price and Income Elasticities

of

Export and Import Demands

Paremeters	Imports	Exports
Price	0.467	1.026
Income	1.9079	1.450

Table 7 gives the calculated long run elasticities. These results are very similar to the equilibrium elasticities. In the long run import demand is again price inelastic but income elastic, and export demand is price and income elastic.

To measure speed of response when the equation is displaced from equilibrium, the median lag is used. It is calculated as;

$$\frac{\log 0.5}{\begin{array}{c}\text{log of elasticity of lagged}\\ \text{export and import}\end{array}}$$

The median lags for imports and exports are   0.472 and 0.28 periods respectively. Thus Turkey's speed of response in the event of a shift from equilibrium in the case of devalution policy is found to be very slow and adjustment will be very difficult in the export and

the import sectors.

3.3.4 Application of Marshall-Lerner Condition

The restricted form of Marshall-Lerner condition (Harberger condition), which is necessary and sufficient condition for successful devaluation, is

$$\frac{M}{X} n_m + n_x > 1 + m$$

$$n_m = 0.47483$$

$$n_x = 1.006$$

$$m = \frac{dM}{dY} = 2.014 \left(\frac{M}{Y}\right)$$

In 1978, billion of liras

$$M = 113.29$$
$$X = 55.36$$
$$Y = 1290.7$$

Therefore $m = 2.014(113.29/1290.7) = 0.1768$

So, the Marshall-Lerner condition is;

$$(113.29/55.36) * 0.47483 + 1.006 = 1.9777 > 1.1768$$

Thus the Marshall-Lerner condition is fullfiled in Turkey.

4. CONCLUSION :

In this study, the price and income elasticities for import demand of and export demand for Turkey are estimated. We also test the effectiveness of the devaluation in correcting BOP deficit in Turkey.

The results of the study show that Turkey has inelastic import demand function, indicating relative prices have no role in the determination of the volume of imports. However, estimated price elasticity for export demand is greater than unity,indicating elastic demand. So favorable changes in relative prices will result in increasing export demand for Turkey.

Income elasticities for export and import demand both are greater than unity. So income is an important factor in determining Turkey's export and import demands. The results also illustrate that if Turkey and the rest of the world grow and inflate at the same rate, the trade balance will turn unfavor of Turkey. This is due to fact that the income elasticity of import demand is higher than the income elasticity of export demand.

The equilibrium cases yield better fit than disequilibrium cases, on a yearly bases. OLS and 2SLS results are both efficient and close to each other in the estimation of the export demand function. This may be the indication of that OLS estimation does not create

simultaneity bias in a small country case. However, this is not the case in import demand function. OLS result indicates best estimation. It was found that the degree of autocorrelation, which is accepted as an indicator of omitted quantitative restrictions in the study, is greater in the import function than the export function. This result is consistent with the view that restrictions are more important in the determination of imports than of exports.

As a basic conclusion, Marshall-Lerner condition is satisfied in correcting Turkey's balance of payment problem through devaluation.

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