

***Title: External Debt and Economic Growth
Relationship Using the Simultaneous Equations***

JEL Classification: F34, C32, H63

***List Of Keywords: Turkey, External Debt, Economic Growth
Simultaneous Equations***

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ABSTRACT

This study will examine the interaction among economic growth, external debt service and capital inflow using time series data for Turkey and using a multi-equation model. The results show that the relationship between debt service and economic growth should be analysed with a simultaneous equation model, because there is a two-way relationship between debt service and growth. The rise in the debt-servicing ratio adversely affects economic growth whereas the decrease in the rate of growth, reduces the ability of an economy to service its debt. When Turkey is servicing its debt, debt servicing could impair economic growth. Servicing a heavy debt may exacerbate the debt problem. In order to service its debt, Turkey had to borrow more. The higher the lagged debt stock the higher the debt service. This result is consistent with the Turkish experience which shows the existence of two way relationships between total debt stock and debt service.

Relationship Using the Simultaneous Equations

1.Introduction

The relationship between external debt, economic growth and capital inflows can become complicated for several reasons. Firstly, there is a relationship between external debt servicing and economic growth. Secondly, government policies designed to influence the balance of payments, domestic interest rates and employment may affect the stock of foreign debt and hence, debt servicing and economic growth both directly and indirectly through their effects on exports, domestic savings and foreign capital inflows. Thirdly, there may be a two way relationship between debt stock and debt servicing. Finally, long term capital inflows, depending on its characteristics may also affect economic growth, investment and debt stock. Moreover, capital inflows could be affected by economic growth. Statistical methods for systems of simultaneous equations capture the mutual dependence among the variables in the model. Techniques in which equations are estimated one at a time are called limited information methods. Full information methods are those where all equations are estimated at the same time. Limited information methods do not take into account connections among variables from different equations within the system. Full information methods allow for these connections. Since all available information is incorporated, this produces more efficient parameter estimation. The three Stages-Least-Squares (3SLS) method used in this paper is a full information method. Variables in the system are categorized as endogenous and exogenous. Simultaneity within the model arises because some endogenous variables appear as explanatory variables in other equations. The set of exogenous variables often includes values of the explanatory variables. These predetermined variables impose the dynamic structure on the model. All

these complications imply that all possible links between debt service, capital inflow and economic growth can be analysed with a simultaneous equation using the 3SLS method for Turkey.

The rest of the paper is organised as follows: Section 2 analyses previous studies. In section 3 a brief theoretical background of debt service and economic growth and capital inflow is provided. Section 4 presents a research design and describe and specify our simultaneous equations. In section 5, theoretical expectations and hypothesis are proposed. Section 6 is devoted to the regression results from the simultaneous equations model and presents and discusses empirical results and their implications. Section 7 discusses impulse response analyses. The conclusions of this paper are then presented in section 8.

2. Some Selected Studies on the Simultaneous Analysis of External Debt Service, Capital Inflows and Economic Growth

There are some studies which have examined the relationship between economic growth and external debt. Chowdhury (1994) investigated the direct, indirect and full effects of external debt on GNP and vice versa, by using a system of simultaneous equations. This study used panel data for the period 1970-1988 on selected countries in Asia and the Pacific, namely Bangladesh, Indonesia, Malaysia, Philippines, South Korea, Sri Lanka and Thailand. This relationship is not a simple one, therefore, a structural simultaneous equation model is set to examine the interrelationships between public and private external debt, capital accumulation and production. The results of the structural model show that the effects of public and private external debts on the GNP level in these countries is small. These results do not support debt overhang argument. It is argued that debt overhang is the main reason for slowing economic growth in indebted countries. Heavy debt burdens

prevent countries from investing in their productive capacity, investment necessary to spur economic growth. Disincentives to investment arise for reasons largely related to investor's expectations about the economic policies required to service debts. The author found that the external debt of developing countries is not a primary cause of economic slow down. The results support the idea which is claimed by Bullock-Rogoff (1990) that there is no urgent need for establishing an international institution for organising debt relief.

Metwally and Tamaschke (1994) examined the interaction between debt servicing, capital inflows and growth for each of the sample countries, namely Algeria, Egypt and Morocco, during the period 1975-1992. In this study, the method of two-stage least squares (2SLS) and ordinary least squares (OLS) were employed to estimate the equations. It is argued that the relationship between foreign debt and economic growth is not explained by one-way relationship. Because of the complex relationship between debt servicing, capital flow and economic growth, they are best examined by simultaneous models. After applying the simultaneous model a number of important results were obtained;

- i- The debt servicing and growth interaction should be examined with a-two way relationship.
- ii- The rise in debt servicing ratio affects economic growth negatively. iii- The debt servicing reduces the economy's growth potential. Thus, debt servicing may make worsen the debt problem of the heavily indebted countries.
- iv- It is also argued that direct private investment is important in the debt-growth relationship, since direct private investment does not affect economic growth but it is also affected.
- v- High growth rates attract equity capital and large inflows of equity capital contribute toward accelerated growth. It does so not only through its direct

impact on the productive capacity of economy, but also by lessening the country's dependence on foreign debt and alleviating the adverse impact of debt-servicing on the economy.

The results of the simultaneous model show that capital inflows have a significant impact on the growth-debt relationship. If direct foreign investment flows in at considerable rates, growth will be accelerated and the need for additional foreign borrowing will be decreased. In addition, it is shown that equity capital flows are not the result of economic growth, also affect economic growth.

Olgun *et al.* (1998) empirically tested interactions between capital inflows, foreign debt stock, economic growth and investment using time series Turkish data pertaining to the 1965-1997 period. Two-stage least squares (2SLS) and three -stage least squares (3SLS) methods were applied to the equations. The model includes five equations similar to Metwally and Tamaschke (1994) with a few different equations and exogenous variables in their equations. Their results show that there is a statistically significant two way relationship between the debt stock and debt service, an increase in the growth rate of debt stock can cause debt servicing to increase. In turn an increase in the growth rate of debt servicing raises the growth rate of the debt stock. Another important finding is that the debt service does not affect the rate of economic growth.

Levy and Chowdhury (1993) examined the direct, indirect and full effects of external debt on GNP and vice versa, by utilising a system of simultaneous equations which show the possible interactions between GNP, capital stock accumulation, public and publicly guaranteed external debt and private external debt accumulation. This was estimated using panel data for the period 1970-1988 on thirty six highly indebted developing countries grouped into three distinct regions: Latin America, Asia-Pacific and Sub-Saharan. They

argue that a country's level of indebtedness may affect the GNP in the following ways: the higher the level of indebtedness, the larger the country's leverage, the more limited the external sources of credit, and the greater the number of incidences of financial distress and liquidation adversely affecting the GNP directly and indirectly through discouraging the GNP level directly and indirectly through discouraging domestic investment. Furthermore, an increase in the public and publicly guaranteed external debt may indirectly depress the level of GNP by discouraging capital formation and encouraging capital flight due to tax increase expectations. Governments raise taxes in order to finance external debt obligations. Savvides (1992) states that the debt induced taxation of capital decreases net returns to investment in indebted countries. Thus, from the perspective of the debtor country as a whole, the debt overhang acts like a high marginal tax rate on the country lowering the return to investment and providing a disincentive to domestic capital formation. They also investigated Bulow-Rogoff's(1990) claim that the external debt of developing countries is not a primary cause of economic slow down. The results of this study support this claim and it is also argued that there is no urgent need for establishing an international institution for organising debt relief and debt rescheduling negotiation between indebted developing countries and their private creditors. The direct effect of the public and publicly external debt on GNP is negative for Latin America.

Morisset (1991) examined the effect of debt reduction within a macroeconomic framework and tested various direct and indirect relationships between external debt, investment and economic growth. He estimated models and carried out simulations for Argentina during 1962-1986 using the three-stage least squares method. In order to explain the drastic reduction in private investment, some direct and indirect channels are considered. It is argued by most authors that if private sector is credit rationed, then the

high level of foreign debt affects productive investment through a disincentive effect. Since the government in most debtor countries appeared unable (or unwilling) to meet increasing debt-service payments, private investors anticipated higher rates of taxation on real and financial assets as well as more instability in the economic environment. These changes affected private investment negatively through the debt overhang effect, which refers to the reduced incentives to invest. In addition, as foreign assets become more attractive relative to domestic assets, this often led to an increase in domestic interest rates, reducing private investment further. The results show that the effect of 30% debt relief is 2.43 % and 5.40 % on GDP level for the first and the fifth year respectively, since debt reduction includes a liquidity effect and an incentive effect; the liquidity effect includes the reduction in net transfers and the incentive effect comes from decline in the stock of debt.

3. Analysis of External Debt Service, Capital Inflows and Economic Growth

This study will examine the interaction among economic growth, external debt service and capital inflow using time series data for Turkey and using a multi-equation model. It will differ from other studies in the following ways:

- i- Longer time series data were used
- ii- The series used will be based on relatively recent data
- iii- Both share variables and growth rates will be employed where possible
- iv- Stationary variables will be used to estimate the multi-equation model by 3SLS method.

The discussion of previous studies shows that the relationship between external debt and economic growth is not simple since many variables used for estimation might be endogenous and the impact of external debt on economic growth may have both direct and

indirect effects. Therefore, investigating the external debt-growth relationship with a multi-equation model should be fruitful. Many developing countries are concerned about the sharp and continuous rise in the proportion of their resources devoted to the service of their foreign debt. Debt servicing can be a real drain on heavily indebted countries, it deprives the economy of the direct and indirect benefits of large percentage of exports. Thus, the country foregoes some important multiplier-accelerator effects. This reduces the ability of its economy to grow and increases its dependence on foreign debt (Metwally and Tamaschke, 1994). The debt service ratio not only affect economic development but it is also influenced by the rate at which development takes place. This is for at least two reasons. Firstly, economies that enjoy relatively higher rates of growth succeed in attracting foreign investment. Capital inflow at substantial rates will reduce the need for borrowing. As the volume of resources devoted to debt servicing is positively related to the size of the debt, economic growth will, through its impact on capital inflow, reduce the debt service ratio. Secondly, accelerated growth results in increasing incomes, and hence domestic savings. This will in turn reduce the need for foreign borrowing to finance investment projects. The slow down in the growth of the stock of debt will result in a reduction in the debt service ratio. Moreover, a country may, in the stage of the take-off, borrow to build its productive capacity, this will accelerate growth, attract foreign investment, and raise the rate of domestic saving. As a result, the need for foreign borrowing will be reduced and the outstanding debt will gradually diminish.

The relationship between foreign debt and economic growth is not a one-way relationship. It is assumed that excessive debt affects a country's economic development in several ways. Firstly, the large debt service requirements dry up foreign exchange and capital, because they are transferred to principal and interest payments. A country benefits

only partially from an increase in output or exports because a fraction of the increase is used to service the debt and accrues to creditors (Savvides, 1992). Secondly, when the debtor countries are unable to meet their debt service obligations promptly, the debtor countries will face bad credit status and find it difficult to borrow. As a result, debtor countries will pay high rate to obtain new credit. Thirdly, the accumulation of debt causes a reduction in the countries' efficiency, since it is difficult to adjust efficaciously to some shocks and international financial fluctuations. Fourthly, to obtain more foreign exchange to meet debt obligations, many debtor countries reduced imports and trade, this causes poor trade performance (Geiger,1990). A developing country, such as Turkey, which has high external debt burden may be analysed in the context of these relationships more accurately.

The international community has long recognised that in its early development stage, a country need a substantial inflow of external foreign financing in order to fill the savings and foreign exchange gap. If the country attracts capital or is able to borrow from abroad, it can ease the foreign exchange shortage and provide a source for necessary imported goods for investment. When investment increases, economic growth also increases. Here, the linkage from capital inflow to economic growth occurs through investment. Higher economic growth in turn increases a country's creditworthiness and this may attract more capital inflows. If the capital inflow is long term or FDI, the need to borrow may decrease. When the need to borrow decreases the growth rate of the debt stock will decline in the following period. Given that the debt service directly depends on the debt stock this implies potentially higher domestic investment and accordingly higher growth and hence higher creditworthiness and more capital inflow. This interrelationship implies that all possible links between debt service, capital inflow and economic growth can be analysed with a simultaneous equation using the 3SLS method for Turkey. The relationship between

external debt and economic growth is not simple and many variables that are used for estimation may be endogenous. The impact of external debt on economic growth may also have direct and indirect effects. Moreover, due to a circular relationship among capital inflows, economic growth, and debt servicing, a single equation model cannot be appropriated to analyse the interactions between these and other macroeconomic variables. Another consideration is that other previous multi-equation studies mainly employed cross-sectional methodologies. There are few single country analyses. All previous studies used shares of variables in their estimation. However, in the time series data for single country analysis, use of shares may not be justified, instead real growth rates of variables can be used. Therefore, this study employs both share variables and real growth rates of variables where possible.

4. The Model and Specification

Other than the case of Metwally and Tamaschke (1994), there have been only limited attempts to analyse the interactions among debt servicing, capital inflows and growth. Accordingly, this paper seeks to extend the contribution of Metwally and Tamaschke by utilising some of the insights provided by the more recent literature. In this study, we construct and use Turkish data to estimate a compact macroeconomic model of debt servicing, capital inflows and growth. Exogenous variables are chosen with reference to Turkey's economy and are considered to represent a more accurate picture of the effects of external debt on, capital inflows and economic growth. The interaction between debt servicing, capital inflows and economic growth should be analysed by the following simultaneous equation:

The following structural equations are proposed for the estimation:

Growth Equation:

$$YR_t = a_0 + a_1 YR_{t-1} + a_2 LFR_t + a_3 DSR_{t-1} + a_4 KR_t + a_5 HR_t + a_6 CIR_{t-1} \quad (1)$$

Debt Service Equation:

$$DSR_t = b_0 + b_1 DSR_{t-1} + b_2 ER_t + b_3 DEB_{t-1} + b_4 I1977 + b_5 EXR_t + b_6 YR_t \quad (2)$$

Capital Inflow Equation:

$$CIR_t = c_0 + c_1 CIR_{t-1} + c_2 S1992 + c_3 (CI/Y)_t + c_4 (CI/DES)_t + c_5 DEB_{t-1} + c_6 Y_t \quad (3)$$

Endogenous Variables:

DSR = the growth rate of debt service

CIR = the ratio of capital inflow

YR = the growth rate of real GNP

Predetermined variables:

EXR = the growth rate of export

CIR = the growth rate of capital inflow

CI/DES = the ratio of capital inflow to the debt stock

CI/Y = the lag of the ratio of capital inflow to the GNP

S1992 = the dummy variable for credit rates

I1977 = the dummy variable for debt crisis

LFR = the rate of domestic absorption

HR = human capital

KR = capital rate

ER = exchange rate

5. Theoretical Expectations and Hypothesis

5.1. Growth Equation

Equation (1) demonstrates that economic growth is determined by growth in labour force,

capital, human capital, debt service, human capital. We expect that labour force, capital, human capital have a positive effect on economic growth. Thus, the coefficients a_2, a_4, a_5, a_6 are expected to be positive. All factors of production may stimulate economic growth. In this context, the increased demand generated by domestic absorption leads to increased utilisation of capital stock and higher labour employment. Increased capital stock utilisation may lead to an increase in the profit rate which in turns may lead to higher investment generating short-run multiplier effects and higher growth rates. However, it is expected that debt service has negative effect on economic growth, hence the coefficient a_3 is negative. Geiger (1990) found that there is a statistically significant inverse relationship between debt burden and economic growth. Sawada (1994) and Rockerbie (1994) show that external debt obligations have a significant negative effect on economic growth. Savvides (1992) states that incentives to invest are weakened because due to the compulsion of debt servicing, the debtor country only shares partially in an increase in output and exports. Thus, from the perspective of the debtor country as a whole, the levels of debt are in fact seen as a tax on investment. Calvo *et al.*(1996) indicates that foreign capital will finance investment and stimulate economic growth. Hence, foreign capital may help to increase the standard of living in the developing countries. Capital inflows can increase welfare by enabling households to smooth out their consumption over time and achieve higher levels of consumption. Thus, we expect that the capital inflows have a positive effect on economic growth. Metwally and Tamaschke (1994) state that the slowdown in growth results in a deterioration of the creditworthiness of the borrowing countries, which in turn reduces the net capital inflow. The net capital inflow is also decreased because of the slow growth in world trade, slow growth in the World Bank lending, and a deceleration of foreign private investment. This suggests that direct private

investment does not only affect economic growth but is also affected by it. High growth rates attract equity capital and large inflows of equity capital contribute toward accelerated growth. It does not only through its direct impact on the productive capacity of the economy, but also by lessening the country's dependence on foreign debt and alleviating the adverse impact of debt-servicing on the economy.

5.1. Debt Service Equation

The equation (2) implies that the debt service is determined by the export growth rate, exchange rate, the growth in external debt stock, economic growth and I1977 dummy variable. From the debt service equation, we expect that the coefficient of debt stock will be positive. It is hypothesised that for a given interest rate on debt, the higher the debt stock the higher will be debt servicing. Alternatively, a country may find itself in a position that it needs new borrowing to service its existing debt even though the interest rate on new borrowing is high. Thus, including the growth rate of debt stock in to the debt servicing equation, we attempt to see whether growth of debt stock explains increasing growth of the debt servicing. We also expect that the exchange rate is positively related to the debt service. The weaker a country's currency a country the less likely it is that foreign capital will invest in that location. A country with a weak currency is associated with an exchange rate risk. This will in turn increase the need for foreign borrowing to finance investment projects. The increase in debt stock will result in increase in debt servicing. On the other hand, export growth has also been included in the debt service equation, because for a typical developing country, exports represent a significant source of foreign exchange earnings and hence a source for the debt service burden. Thus we expect debt service to decrease when growth of exports increases. Ram (1985) suggests that there are some reasons whereby one can justify that exports are a production function input. In doing so,

exports have great impact on aggregate output for a given level of labour and capital. The reason behind this is that a high level of exports lead to a more efficient allocation of resources in terms of the basic concept of comparative advantage and production efficiency. Moreover, exports may speed up the exploitation of economies of scale, increase capacity utilisation and lead to greater rate of technological change. Furthermore, increasing exports may relax the foreign resources restriction and increase the productivity of the other production inputs. Feder (1982) asserts that this occurs via two channels: - higher marginal productivity and externalities -through which rapid export growth can effect the rate of economic growth in excess of the contribution of net export growth to GNP. Moreover, Cunningham (1993) affirms that conventional wisdom was challenged by the debt servicing problems of many nations during the 1980's when it became evident that it was possible for nations to become overwhelmed by debt. For heavily indebted nations, growth in exports only led to the payments of interest and principal on the debt which inhibited incentives for investment and growth in developing countries. Afxentiou (1993) shows that the ability of countries to pay their debts depends upon *ceteris paribus* conditions, based on a comparison between their export growth rates and interest rates on their foreign debt. As long as the export growth rates are higher than the interest rate on external debt, the ability to pay of countries improves and borrowers can service their debt without sacrificing any of their own national resources. Likewise, when the export growth rates are lower than the interest rates on external debt and the ability to pay of countries are worsened, any increase in exports, will decrease debt service, when other things are being equal.

In order to assess the effect of debt crisis in 1977, we also used a dummy variable, I1977, for debt crisis. Since after the payments crisis of 1977, Turkey entered into a long series of debt negotiations that succeeded largely because of OECD support and agreements

with the IMF. The last explanatory variable is economic growth. It is hypothesised that there is a negative relationship between economic growth and debt service. The debt service does not only affect economic growth but is also influenced by economic growth. If economies succeed high growth rates, it will attract foreign investment, and this will reduce the need for external debt. As a result, the slow down in the debt stock will result in debt service.

5.3. Capital Inflow Equation

This equation examines the relationship between the capital inflow and the GNP growth rate, the ratio of capital inflow to GNP (CI/Y), the ratio of capital inflow to debt stock (CI/DES) and lag of debt stock are used to explain that foreign investment may effect or reflect the investment climate and /or actual increase in number of profitable investment opportunities. Metwally and Tamaschke (1994) certify that if a country enjoys high growth rates in GNP and are willing to offer high interest rates, this will attract more capital inflow. High growth rates attract equity capital and large inflows of equity capital contribute toward accelerated growth. It does not only through its direct impact on the productive capacity of economy, but also lessening the country's dependence on foreign debt and alleviating the adverse impact of debt-servicing on the economy. Therefore, we expect both (CI/Y) and (CI/DES) to have positive signs. The variable dummy 1992 implies credit rationing for Turkey. Any improvement in the credit will attract more foreign capital. The slowdown in growth results in a deterioration of the creditworthiness of the borrowing countries, which in turn reduces the net capital inflow. Debt accumulation is primarily due to deficits in the current account which need to be financed by running down foreign exchange reserves. Levy and Chowdhury (1993) claim that an increase in the public and publicly guaranteed external debt may indirectly affects the level of GNP by discouraging

capital formation and encouraging capital flight due to tax-increase expectations. This implies that any increase in the debt stock, results in a decrease in capital inflow. The link between debt stock and capital inflow should be negative.

Metwally and Tamaschke (1994) state that the slowdown in growth results in a deterioration of the credit worthiness of the borrowing countries, which in turn reduces net capital inflow. Net capital inflow is also decreased because of the slow growth in world trade, slow growth in the World Bank lending, and deceleration of foreign private investment. This suggests that direct private investment not only affects economic growth but is also affected by it. High growth rates attract equity capital and large inflows of equity capital contribute toward accelerated growth. Calvo *et al.*(1996) note that foreign capital will finance investment and stimulate economic growth. Hence, foreign capital may help increase the standard of living in the developing countries. Capital flows can increase welfare by enabling households to smooth out their consumption over time and achieve higher levels of consumption. Thus, we expect that the capital inflow has a positive effect on economic growth.

Table 1 present the expected signs of variables for our estimation.

<i>Growth</i>	$a_1 > 0$	$a_2 > 0$	$a_3 < 0$	$a_4 > 0$	$a_5 > 0$	$a_6 > 0$
<i>Equation</i>						
<i>Debt Service</i>	$b_1 < 0$	$b_2 > 0$	$b_3 > 0$	$b_4 < 0$	$b_5 < 0$	$b_6 < 0$
<i>Equation</i>						
<i>Capital inflow</i>	$c_1 > 0$	$c_2 < 0$	$c_3 > 0$	$c_4 > 0$	$c_5 < 0$	$c_6 > 0$
<i>Equation</i>						

6. Issues Related to Model Estimation

This study uses time series for Turkey during the 1959-1996 period, and utilizes 3SLS (three-stage least squares) estimation techniques. Gujarati (1995) claims that the basic idea behind the 2SLS method is to replace the stochastic endogenous explanatory variable by a linear combination of the predetermined variables in the model and use this combination as the explanatory variable in lieu of the original endogenous variable. The 2SLS method thus resembles the instrumental variable method of estimation in that the linear combination of the predetermined variables serves as an instrument, or proxy, for the endogenous regressors. Therefore we employed 3SLS for our estimation. The basic idea behind using 3SLS (three-stage least squares) is that 2SLS is a single equation estimation method and is a type of limited information method because it ignores information in the other equations. We also used 3SLS which takes into account the information contained in the off-diagonal elements of covariance matrices, thus 3SLS is asymptotically more efficient than 2SLS (Judge *et al.*, 1988). Three-stage least squares (3SLS) is a system method, which is applied to all the equations of the model at the same time and gives estimates of all the parameters simultaneously. It contains the application of the method of least squares in three successive stages. This method employs more information than the single equation techniques, that is, it takes into account the whole structure of the model with all restrictions that this structure imposes on the values of the parameters (Kotsoyiannis, 1977).

The system of equations was estimated by using a three-stage least squares (3SLS) procedure, for several reasons. First ordinary least squares separately applied to each structural equation would result in biased and inconsistent estimators, given the correlation between the error terms and endogenous variables. Secondly, the order condition shows

that all equations are over identified, so that an indirect least squares procedure cannot be used, since it is not possible to get unique estimates of structural parameters. Thirdly, 2SLS procedure would solve the simultaneous equation bias as well as the identification problem when the equations are over identified. Since each structural equation is not exactly identified, and the contemporaneous variance-covariance matrix was nondiagonal, 3SLS procedure is asymptotically more efficient than 2SLS. Identifying restrictions are required in any simultaneous systems technique. These restrictions, which typically involve the exclusion of variables from some equations, enable the parameters of the model to be derived uniquely. The simplest identifying restriction is the order condition which requires that the number of exogenous variables excluded from an equation is at least as large as the number of endogenous variables included in that equation. To check for correctness of the specification and for the internal consistency of the entire system the Likelihood Ratio (LR) test has been employed. This tests whether the model is a valid reduction of the system. The test results show that we cannot reject the proposition that the model is a valid reduction of the system and then the most efficient estimates may be obtained with 3SLS. Consequently, 3SLS is used as the estimation technique in the remainder of this study. LR test of over-identifying restrictions: $\chi^2(21)=40.507 (0.0064)**$.

Data for this paper were compiled from several publications. The data on the capital which is proxies by gross fixed investment, economic growth, exchange rate and capital inflow data were taken from SPO, Turkey, *Economic and Social Indicators*, 1950-1998. External debt service (interest payments and amortisation) and debt stock data were taken from IMS Financial statistics (various years) . Capital inflow includes long-term capital inflows, foreign domestic investments, project credits, programme credits until 1975 and foreign direct investment, portfolio investment, drawing and Dresdner since then. S1992

is used for Standard & Poors Long Term Credit Rating which started to be used as a creditworthiness indicator for Turkey in 1992. A dummy variable for credit rating was used, to measure the effects of this credit rating on Turkey after 1992. This dummy variable takes a value of one for the years 1992-1996, since we are trying to take account the sharp real income decline and inflation acceleration in these years.

6.1. The Empirical Analysis

6.1.1. Testing for Unit Roots

Applying the rank and order conditions of identification to the structural model, it can be shown that every equation is over identified. Before conducting the simultaneous tests, the variables must be found to be individually stationary. If both are not stationary, they must be cointegrated. The series, say Y_t will be integrated of order d , that is $Y_t \sim I(d)$, if it is stationary after differencing d times, so Y_t contains d unit roots. A series that is $I(0)$ is stationary. In this study, the augmented Dickey-Fuller (ADF) test is used for this analysis. Unit roots tests are used which is developed by Dickey and Fuller (1979). Before estimation we then apply the Dickey-Fuller (DF) test and Augmented Dickey-Fuller test (ADF) for unit roots a formal test to investigate the unit root. The test results reveal that the hypothesis of unit roots in all variables can be rejected at 1% and 5% significance level. Table 9 shows that all the variables in growth rates are integrated of order zero (i.e. stationary).

Table 2. Unit Test Results for Variables

Variables	DF test			ADF test		
	Calculated	1%	5%	Calculated	1%	5%
YR	-6.787**	-4.202	-3.525	-4.938**	-4.209	-3.528
DSR	-6.768**	-4.202	-3.525	-5.178**	-4.209	-3.528
EXR	-5.84	-4.202	-3.525	-4.82**	-4.209	-3.528
DEB	-7.205**	-4.202	-3.525	-5.302**	-4.209	-3.528
CIR	-7.399**	-4.202	-3.525	-6.537**	-4.209	-3.528
ER	-6.534**	-4.202	-3.53	-4.837**	-4.209	-3.528
CI/Y	-4.615**	-4.202	-3.525	-4.311**	-4.209	-3.528
LFR	-5.464*	-4.202	-3.525	-3.984**	-4.209	-3.528
KR	-6.831**	-4.202	-3.525	-5.177**	-4.209	-3.528
HR	-7.333**	-4.202	-3.525	-6.518**	-4.209	-3.528
CI/DES	-5.667**	-4.202	-3.525	-4.863**	-4.209	-3.528

Note: The reported critical values are obtained from PC-Give 8 versions and correspond to 38 observations for Dickey-Fuller (DF) test and 39 observations for Augmented Dickey-Fuller (ADF) test. For calculated value's intercept and trend included in the DF and ADF test.

***means significant at 1percent level

6.1.2. Statistical Results for Growth Equation

Table 3. Estimation of 3SLS Structural Form ; Regression Coefficients of Growth Equation

Variables	Coefficients	t-values	t-probabilities
Constant	4.306	5.25	0.00
YR_{t-1}	-0.291	-2.29	0.03
LFR	0.533	2.39	0.02
DSR_{t-1}	-0.028	-2.43	0.02
KR	0.149	4.90	0.00
HR	0.048	2.26	0.03
CIR_{t-1}	0.01	1.08	0.29

Where, DSR =the growth rate of debt service, LFR = labour force rate, KR = capital rate, HR = human capital rate, YR =the growth rate of real GNP, CIR = capital infow

From the equation 1, the results support our expectations in terms of the sign of coefficients. In explaining GNP growth rate the estimation results strongly suggest that the first lag of debt service did significantly and negatively affect economic growth for the period 1960-1996. Realistic formulation of economic relations often require the insertion of lagged values of variables. For instance, an increase in debt service is likely to have an impact on economic growth which is distributed over a number of periods. As a result of the increased pressure to obtain more foreign exchange to service the debt, many indebted nations restricted imports and reduced trade. Therefore, it is worth considering the lag structure of the model. To do this, one lag is used for debt service. The regression results with lags indicate that the lagged debt service or in other words, the previous year's debt service has significant and negative impact on the Turkish economic growth. Hence, we conclude that in Turkey, debt service is having a debt overhang effect on GNP. Servicing a heavy debt contributes toward the deterioration of the debt problem of the Turkey. The results also support (Metwally and Tamaschke, 1994) findings for heavily indebted North African countries-namely Algeria, Egypt, and Morocco. The coefficients of variable debt servicing is negative and statistically significant in each country. Servicing a heavy debt could seriously damage economic growth. It takes a large benefits from the domestic economy to transfer to the foreign economy. Thus, servicing a heavy debt may actually contribute toward increasing the debt problem of the heavily indebted country (Metwally and Tamaschke, 1994).

Human capital and capital have significant influence on the economic growth. All factors of production may stimulate economic growth. Increased capital stock utilisation and investment in human capital may lead to an increase in the profit rate which may in turn lead to higher investment, thus generating short-run multiplier effects and higher growth

rates. On the other hand, labour force is significant in the estimation. Moreover, the first lag of economic growth is negative and significant. This may be the result of the volatility in Turkish economic growth, the country's higher leverage and a greater the number of the incidence of financial distress and liquidation (Levy and Chowdhury, 1993). It is expected that capital inflow play an important role in the economic growth and external debt relationship. The need to borrow will be reduced and economic growth will be accelerated if foreign direct investment comes at substantial rates. The estimation results show that capital inflow is not significant in economic growth equation. This may be the result of unstable real exchange rate, some bureaucratic restrictions and taxes. All these problems have an adverse effect on capital inflow.

6.1.3. Statistical Results for the Debt Service Equation

Table 4. Estimation of 3SLS Structural Form ; Regression Coefficients of Debt Service Equation

Variables	Coefficients	t-values	t- probabilities
Constant	54.185	2.33	0.02
<i>DSR</i> _{<i>t</i>-1}	-0.144	-0.99	0.33
<i>ER</i>	1.019	2.03	0.05
<i>DEB</i> _{<i>t</i>-1}	1.254	1.87	0.07
<i>I1977</i>	-138.91	-2.11	0.04
<i>EXR</i>	-0.515	-0.97	0.33
<i>YR</i>	-6.076	-1.66	0.11

Where, DSR= the growth rate of debt service, EXR= the growth rate of export, DEB= the growth rate of debt stock, YR= the growth rate of real GNP, ER= the exchange rate and I1977= dummy variable for debt crisis.

Table 4 shows the debt service equation results. In explaining debt service, in 3SLS estimation, exports have a negative effect on debt service but the effect of exports are insignificant. It is expect that that a significant and negative relationship between export and debt servicing would be the case because countries with promising export potential

tend in succeed to obtaining more foreign loans and, hence carry larger external debt and have a larger foreign debt servicing burden (Feder, 1980). However, exports are not as significant as expected. It is hypothesised that debt service is strongly affected by growth in exports of good and services. Olgun *et al.* (1998) claim that export growth has been volatile since 1980. Before the 1980s, Turkey's import regime was characterised by quotas, tariffs licensing and other restrictive tools. As the stabilisation programme came into effect in the Turkish economy at the beginning of 1980s, these restrictions were removed gradually. In order to solve the mounting foreign debts, large trade deficits and rising debt service, the Turkish government was determined to increase exports through various policies. e.g., successive devaluations of the lira, export subsidies (under the system of generous tax rebates), duty-free imports of raw materials and intermediate goods for export industries. To get a significant negative result, we may separate the effect of exports into two terms, before 1980s and after 1980s.

The exchange rate (ER) has positively significant on the debt service. Since the stabilisation programme went into effect Turkey has experienced sharp and continuous devaluations. These have adversely affected Turkey's terms of trade. The terms of trade are becoming less favourable for two reasons: one is from the depreciation of the Turkish lira against the dollar, and the other is due to being an exporter of agricultural products and traditionally labour intensive light manufactured goods whose prices in world markets decline in relation to industrial products, particularly to new industrial goods (Ceyhun, 1992). We assume that the evolution of exchange rate (ER) is strictly dependent on domestic policy. However, one has to keep in mind that most of the capital goods needed for investment in less developing countries (LDCs) are imported. Fry (1989) follows the structuralist approach in arguing that real exchange depreciation will increase the cost of

imported capital equipment and will thus reduce the rate of investment. However, an appreciation of the real exchange rate penalizes exports, thereby limiting the amount of hard currency revenues that a country can obtain and spend not only for debt servicing obligations but for importing capital goods as well. A real appreciation of the exchange rate is thus a double-edge sword, and the benefits might be outweighed by its negative impact.

In our estimation, the lag effect of external debt stock on external debt service is positive. This means that as external debt stock increases, the debt service also increases. These results confirm our hypothesis. According to our findings, servicing a heavy debt deteriorate the debt problem. Turkey had to borrow more in order to service its debt. This result is consistent with the Turkish experience which shows the existence of two way relationships between total debt stock and debt service. Foreign borrowing may contribute to development if the borrowing countries use them exclusively to finance capital imports, not, as in the 1970s, primarily to finance balance of payments deficits or popular welfare programmes. If foreign inflows do not necessarily promote development, their outflows may nevertheless prove to be a serious drain on an economy and adversely affect its economic development. Whether foreign indebtedness eventually ends up being beneficial or harmful to debtor country does, therefore, depend upon how the country uses the resources it has borrowed. On the other hand, the results show that there is a two-way relationship between debt service and growth. It can be seen that the debt service has a negative effect on economic growth in growth equation. In the debt service equation, the economic growth has a negative relationship with debt service. The rise in the debt-servicing ratio adversely affects economic growth whereas the decrease in the rate of growth reduces the ability of an economy to service its debt. During the 1970's the bulk of

foreign loans was used by developing nations to buy time and to absorb the shock from oil price increases as painlessly as possible. Such difficulties were destined to emerge in time if foreign loans were not productively employed domestically, and if developing countries failed to earn the foreign exchange required to meet their debt obligations. Faced with resource squandering and failure to boost their foreign exchange earnings, countries were forced to introduce restraining policies and as a last resort to ask for debt forgiveness and rescheduling. These events began unfolding in an intensive fashion, when the debt crisis erupted and debt overhang became a reality in some cases. Moreover, large debt service payments divert foreign exchange and capital from domestic investment to principal and interest requirements. The inability of a debtor country to service the debt without delay affects its credit, and if the problem persists, the nation will eventually have difficulty borrowing for new projects. The scissors effect of declining capital inflows along with increasing debt service payments obviously creates problems for the debtor country. The accumulation of debt reduces the countries' efficiency, in as much as it makes it more difficult for the country to adjust effectively to major shocks and international financial fluctuations. As a result of the increased pressure to obtain more foreign exchange to service the debt, many indebted nations restrict imports and reduce trade (Geiger, 1990).

The I1977 was used as a debt crisis and debt rescheduling indicator. Using the dummy variable for debt crisis and debt rescheduling, we tried to capture the effects of debt rescheduling on debt service performance. As we explained, the external debt burden caused a loss in creditworthiness and payments crisis in 1977. This crisis forced Turkey to the negotiating table in order to seek additional credit. Turkey negotiated with the international Monetary Fund (IMF) and the OECD consortium had agreed upon general conditions to be attracted to a rescheduling of its debt. Even though imposed the debt

rescheduling had an extra burden on the Turkish economy, the debt rescheduling did give an additional help to servicing the debt. The results indicate that the I1977 dummy is significant at 5 percent level in 3SLS estimation.

6.1.4. Statistical Results for Capital Inflow Equations

Table 5. Estimation of 3SLS Structural Form ; Regression Coefficients of Capital Inflow Equation

Variables	Coefficients	t-values	t- probabilities
Constant	-89.173	-2.77	0.01
CIR_{t-1}	-0.277	-2.12	0.04
S1992	-14.808	-0.60	0.55
CI/Y	1888.04	3.23	0.00
CI/DES	487.3	3.97	0.00
DEB_{t-1}	0.559	1.06	0.29
YR	-3.92	-1.21	0.23

Where, DEB = the growth rate of debt stock, CIR = the growth rate of capital inflow, CI/DES = the ratio of capital inflow to the debt stock, CI/Y = the ratio of capital inflow to GNP, YR = the growth rate of real GNP, $S1992$ = the dummy variable for credit rate.

Table 5 shows the results of capital inflow equation. The capital inflow equation expresses the ratio of long-term capital inflows to GNP (CI/Y) as a function of the growth rate of GNP(YR), international creditworthiness, which is proxy by dummy S1992 and the lagged long-term capital inflow to GNP ratio (CIR_{t-1}). GNP growth rate, YR, influenced creditworthiness and raised capital inflow in the previous period will represent improved economic performance and a lower default risk, hence it encourages more capital inflows. GNP growth rate (YR) is found to be negative in our estimation but it is insignificant. It indicates that higher growth rates will not attract more capital inflows. This may be because of the high volatility of GNP growth rate in Turkey between 1960 and 1996 (Olgun *et al.*,

1998) and tax increase expectations (Levy and Chowdhury, 1993). Estimation results indicate that there is no significant impact of debt stock on capital inflow. Moghadam *et al.*(1991) state that a country with good credit standing in international money markets may be able to finance a high debt service ratio, through a high level of borrowing. S1992 dummy represents the creditworthiness indicator for Turkey since 1992. Using the dummy variable for credit rating, it is found that the credit dummy is negative but insignificant. It is interesting that the ratio of capital inflow to GNP (CI/Y) and the ratio of capital inflow to debt stock (CI/DES) are both significant and positive, which implies that equity capital inflows have therefore played a major role in the growth-external debt relationship. This could be the result of special factors, such as the need for long-established foreign firms to increase nominal capital which had eroded by inflation and to carry out replacement investments, the switch in policy stance towards allowing market forces and competition to play a greater role in the economy, the improvement of administrative procedures and the combination of the welcoming attitude of the administration towards attracting new foreign direct investment. This result confirms our expectations, which is the need to borrow will be decreased and growth of GNP will be raised if long-term capital inflows increase at substantial rates.

6.2. Direct and Total Effect of the Exogenous Variables on Growth (YR), Debt Service (DSR) and Capital Inflow (CIR) Equation

A major difficulty in applying simultaneous equation models is the use of the estimated coefficients for inference. Because endogenous variables appear on both sides of the equation, the influence of an exogenous variable is both direct and indirect. As such, the interpretation of a structural coefficient is that it represents the partial effect of the exogenous variable on an endogenous variable can be obtained from the reduced form

coefficient. Reduced form equations results are shown in Table 6. Reduced form the endogenous variables expressed in terms of the exogenous variables, were calculated from the structural equations. In this case, all restrictions on the structural parameters implied in the specification of the structural equations have been accounted for. The coefficients in the derived reduced form measure the total effect of changes in all predetermined variables upon each of the endogenous variables. They also measure the impact of predetermined variables that are excluded from a structural equation.

Table 6. Direct and Total Effect of the Exogenous Variables on YR, DSR and CIR

<i>Exogenous Variables</i>	<i>YR</i>		<i>DSR</i>		<i>CIR</i>	
	<i>Direct Effect</i>	<i>Total Effect</i>	<i>Direct Effect</i>	<i>Total Effect</i>	<i>Direct Effect</i>	<i>Total Effect</i>
<i>Constant</i>	4.3	3.95	54.18	-77.23	-89.17	-145.13
<i>YR_{t-1}</i>	-0.29	-0.33		-0.44		0.09
<i>DSR_{t-1}</i>	-0.02	-0.03	-0.14	0.02		0.32
<i>ER</i>		-0.03	1.01	1.1		0.49
<i>CIR_{t-1}</i>	0.01	-0.01		-0.36	-0.27	-0.66
<i>CR</i>	0.14	0.14		-1.21		-0.29
<i>LFR</i>	0.53	0.5		-0.46		-0.43
<i>HR</i>	0.04	0.05		-0.74		-0.22
<i>I1977</i>		-1.02	-138.91	48.2		103.63
<i>S1992</i>		-0.09		-37.53	-14.8	-33.57
<i>CI/Y</i>		-29.87		1472.78	1888.04	2494.35
<i>CI/DES</i>		6.4		519.98	487.3	626.607
<i>EXR</i>		0.03	-0.51	-0.24		0.14
<i>DEB_{t-1}</i>		0.002	1.25	0.71	0.55	0.41

Where, *DSR*= the growth rate of debt service, *EXR*= the growth rate of export, *DEB*= the growth rate of debt stock, *CIR*= the growth rate of capital inflow, *CI/DES*= the ratio of capital inflow to the debt stock, *CI/Y*= the ratio of capital inflow to GNP, *YR*= the growth rate of real GNP, *ER*= the exchange rate, *S1992*= the dummy variable for credit rate, *LFR*= labour force rate, *CR*= capital rate, *HR*= human capital rate and *I1977*= dummy variable for debt crisis,

Table 6 shows some interesting results. Most of the results conform with the theoretical analysis. For the growth equation, both the direct effect and total effect of exogenous variables on the growth equation (YR) are the same sign. The direct effect of first lag of debt service on economic growth is negative. However, the adverse indirect effects of external debt service on economic growth through lowering private investment and overall level of capital stock are larger than the direct effect. Thus, the total effects of external debt service on economic growth are large and exceed the direct effects. According to our results, one percentage point increase in the growth rate of the external debt service is likely to reduce the economic growth by 0.03 percentage points. The total and direct effect of capital, human capital and labour is positive. The total effects of these variables on economic growth are different. In terms of total effect, one percentage increase in the growth rate of the capital, human capital and labour force increase economic growth by 0.14, 0.05 and 0.50 percentage points respectively. For the debt service equation, the direct effect of DEB_{t-1} and EXR are larger than the total effect and both effects are positive. An increase in the growth rate of the first lag of debt stock cause debt servicing to increase. An increase of one percent in the debt stock rate is likely to directly raise debt service by 1.25 percent. It is found that the higher the value of exports the lower the external debt service. However, in export cases the favourable indirect effects of the exports on debt service the lowering debt burden are large in absolute value and substantially exceed the direct effects. Hence, the total effect of the export on debt service is negative and smaller than the direct effects. An increase of one percent in the export rate is likely to directly decrease the debt service growth rate by 0.51 percent. On the other hand, the exchange rate (ER) raises external debt services. The direct effect and total effect

of the exchange rate on external debt service growth rate is positive. The total effect of the exchange rate on external debt service rate is bigger than the direct effect. In respect to total effect, an increase of one percentage in the exchange rate is likely to increase external debt service rate by 1.10. Moreover, the total effect of I1977 has the opposite sign (positive) when compared with the direct effect (negative sign) as hypothesised the theoretical part of this study. The direct effect of I1977 is negative. However, the indirect effects of the debt crisis and debt rescheduling situation on debt service growth rates through increasing capital inflows the early 1980s substantially exceed the direct effects. Therefore, the full effects of I1977 on debt service growth rate are positive.

For the capital inflow equation, both the direct effect and total effect of exogenous variables on the capital inflow equation (YR) are the same sign. Most of the results conform with the theoretical analysis. Moreover, the total effect of the 3SLS equations model is larger than the corresponding direct effect of reduced form equations. Yet, the direct effect of DEB_{t-1} is larger than the total effect in our estimation. The direct effect of the external debt stock on capital inflow is positive. It is interesting that these results are in contrast to the capital-flight argument. Levy and Chowdhury (1993) claimed that an increase in the external debt might indirectly depress the level of GNP by discouraging capital formation and encouraging capital flight due to tax -increase expectations. The indirect effect of the external debt on capital inflow is larger than direct effect. Thus, the total effect of debt stock is smaller than the direct effect. Moreover, the total effect of CI/Y and CI/DES are larger than the direct effect .

7. Impulse Response Analysis

Based on the our simultaneous equations previously specified, we estimate the impulse response functions for economic growth, debt service rate and capital inflow rate. To

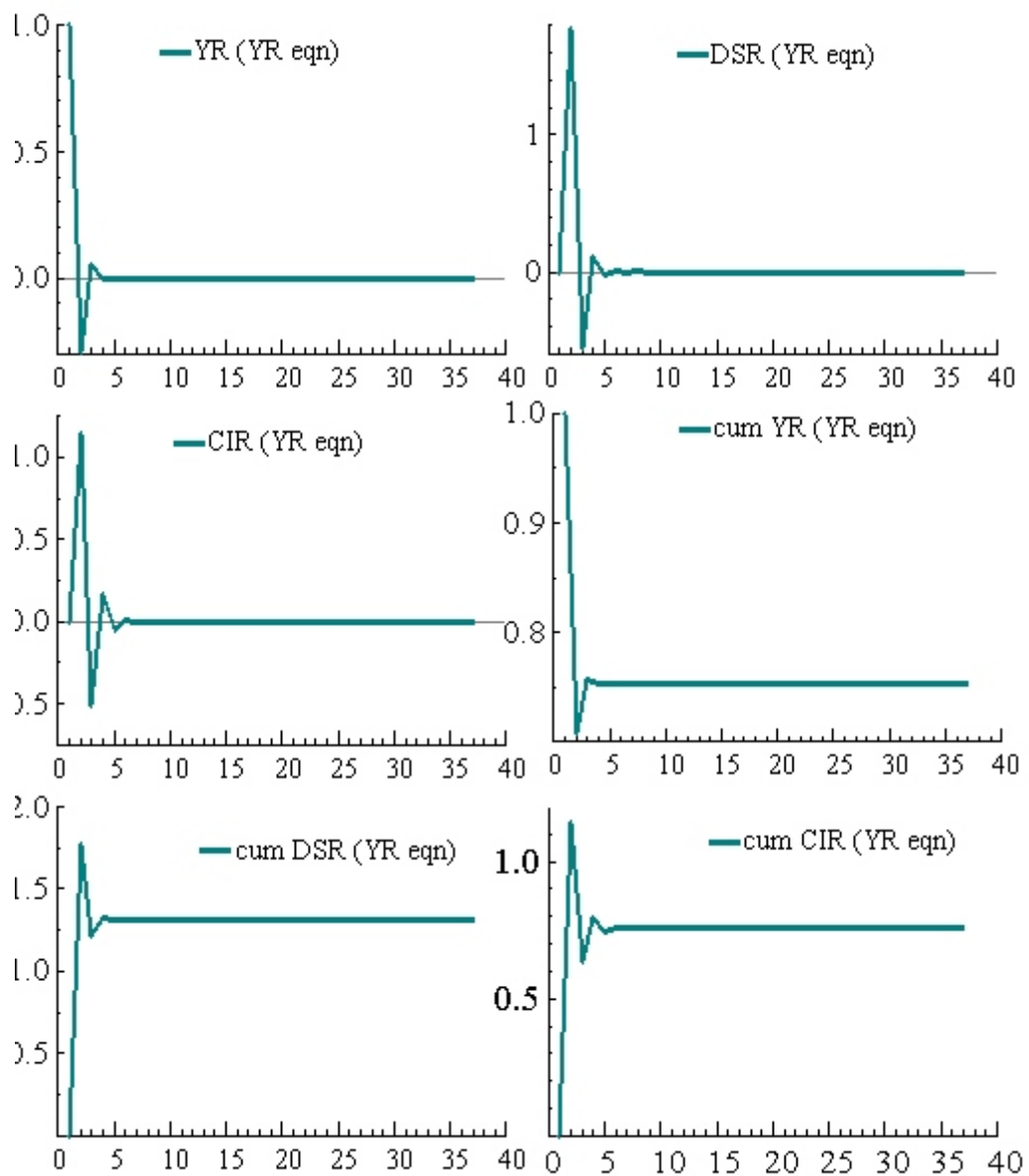
determine the directional effect of the exogenous variables has on each equations, an impulse response function of each equation can be used. Sims (1980) states that the best descriptive device for understanding the inherent system dynamics in the analysis of the system's response to random shocks. This response has become known as an impulse response function. The random shocks are positive residuals of one standard deviation unit in each equation in the system. The idea is to calculate the response of the variables in the system to a shock of one standard deviation.

7.1. Impulse in Growth Equation

First we see in Figure 1 the response of economic growth to a shock of one standard error in the growth equation. Figure 1 shows the dynamic responses of output growth rate (YR), debt service rate (DSR) and capital inflow rate (CIR) to a shock of one standard deviation in the growth rate equation. Firstly, as can be seen from Figure 1, a one standard error shock to the economic growth equation leads to increase in economic growth (YR) by maximum of 1 per cent. Secondly, given a shock of one standard error in the growth rate equation, as can be seen from Figure 1, a one standard error shock to the growth equation leads to increase in debt service rate (DSR) by maximum of 1.80 per cent between first and the second year, there is a step upward movement reaching its peak level, and then output finally recovers from the initial shock to the debt service. Then real output adjusts back to its potential level gradually. This may result from the rise in debt servicing. The increase in debt servicing adversely effects growth, whereas the decline in the rate of growth weakens the ability of the economy to service debt. Thirdly, one standard error shock to the economic growth equation leads to increase in capital inflow more than one percent after first year and then decrease 0.5 percent. The increase in the capital inflow is expected

as we hypothesised that capital inflow plays an important role in the economic growth and external debt relationship. The high growth rates encourage foreign capital inflows. The need to borrow will be reduced and economic growth accelerated if foreign direct investment comes at substantial rates.

Figure 1. Impulse in Growth Equation



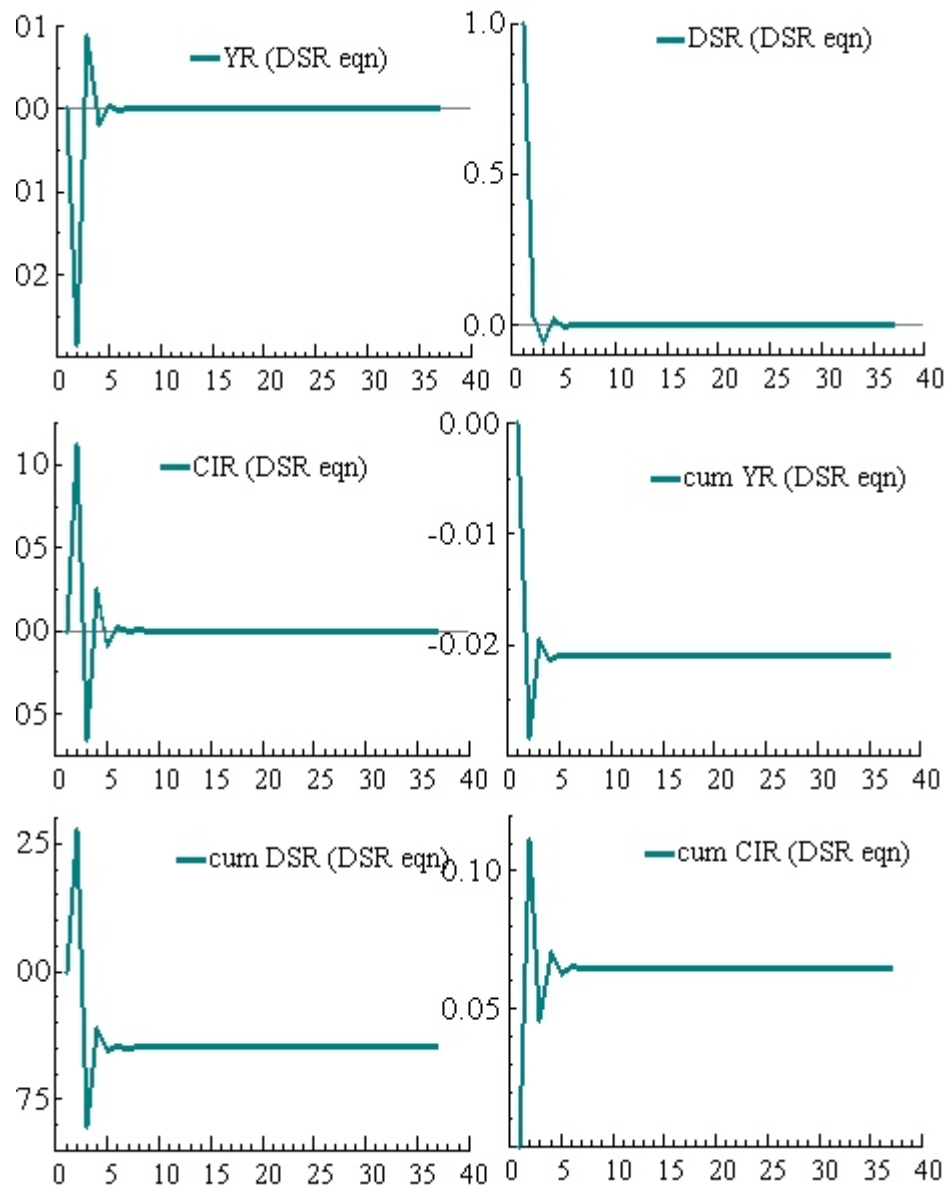
Note: Cum indicates accumulated responses of the variables.

7.2. Impulse in Debt Service Equation

Impulse responses of the output growth rate (YR), debt service rate (DSR) and capital inflow rate (CIR) to debt service shock are found in the Figure 2. Firstly, in response to the debt service shock, economic growth decreases between the first and second year, and there is a step upward movement reaching its peak level, and then output finally recovers from the initial shock to the debt service. Then real output adjusts back to its potential level gradually in fifth year. As can be seen from Figure 2, a one standard error shock to the debt service equation leads to a decrease in economic growth (YR) by a maximum of 0.03 per cent. These impulse responses again accord well with standard macro theory and our hypothesis. The direct effect of debt hypothesis proposed that even if debt service payments do decrease investment and saving levels considerably, then debt affects economic growth directly by reducing productivity. It is also argued that the direct effect of debt hypothesis suggests that debt service payments may affect the growth rate negatively even if debt service payments do not affect investment levels (Fosu, 1996). In response to the debt service shock, the debt service indicates that external debt *deters* economic growth, depending on the level of the debt. When economic growth is slow or when the private sector does not have incentives to invest, the government may need to pursue fiscal and / or monetary policy to stimulate the economy and may resort to debt financing. On the other hand, when economic growth is normal or above the long-term trend, an increase in debt may be detrimental to real GDP growth. This is because of an increase in debt, this may push interest rates upward and reduce private investment.

Impulse responses of the debt service rate (DSR) to its own shock are found in the second figure. In response to own shock, the debt service rate (DSR) decreases over time and there is a temporary increase between third and fourth terms; after that the debt service rate back to its potential level. Impulse responses of the capital inflow to one standard error shock to (DSR) are found in the third figure. A one standard error shock to the capital inflow equation leads to increase in economic growth (YR) by about 0.10 per cent and only within two years and then there is an decrease in the third year, which is about 0.07. It is interesting that any shock in the first year leads to increase capital inflow. Moghadam *et al.*(1991) state that a country with good credit standing in international money markets may be able to finance a high debt service ratio, through a high level of borrowing.

Figure 2. Impulse in Debt Service Equation



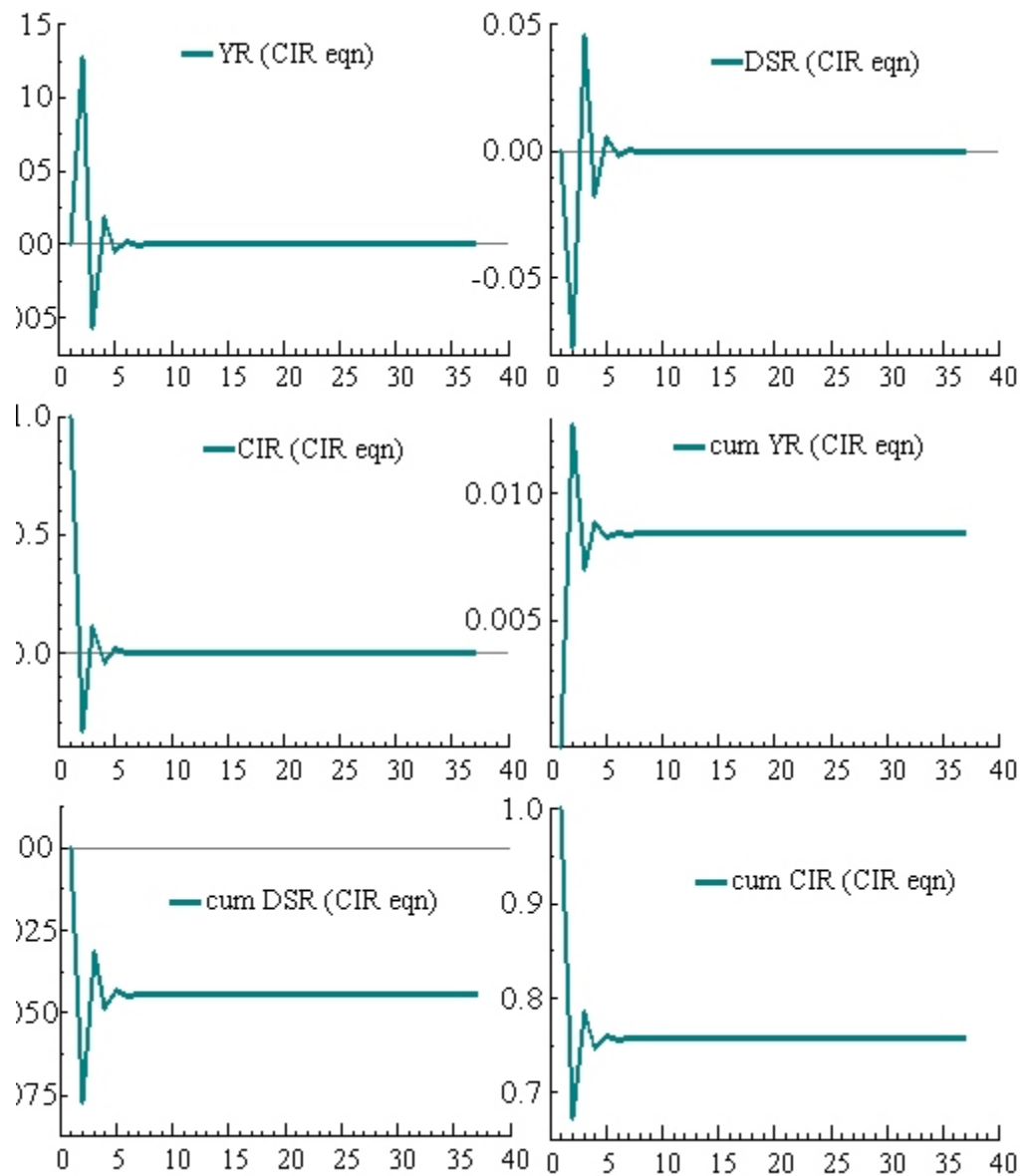
Note: *Cum* indicates accumulated responses of the variables.

7.3. Impulse in the Capital Inflow Equation

Figure 3 shows the dynamic responses of the output growth rate (YR), debt service rate (DSR) and capital inflow rate (CIR) to a shock of one standard deviation in capital inflow equation. The first figure suggests that a shock in the capital inflow would increase the economic growth. A one standard error shock to the capital inflow equation leads to increase in economic growth (YR) by a maximum of 0.01 per cent and only within two years. This means that if a country does not enjoy high growth rates in GNP and is not willing to offer high interest rates, this would not attract more capital inflow. Our estimation results show that due to high volatility in economic growth rates, the economic growth will not attract capital inflow. Higher economic growth rates increases country's creditworthiness and this may attract more capital inflows. Moreover, if the capital inflow is long term or foreign direct investment, the country's foreign borrowing may decrease. As the country's foreign borrowing decrease the growth rate of debt stock will decline. As we expected that a country's the debt service depends on the debt stock. This means that the growth of debt service is also decline. A one standard error shock to the capital inflow equation leads to decrease in the debt service growth rate (DSR) by maximum of 0.07 per cent and only within two years. Increasing in debt accumulation is primarily due to deficits in the current account which needs to be financed by running down the foreign exchange reserves or capital account surpluses (capital inflows) or borrowing from international capital markets. The higher the capital inflows and current account surpluses, the lower will be the need to borrow and hence the lower the debt service. The major difference is that CIR shocks are overwhelmingly the most important in predicting capital inflow in this system and the CIR shocks are unimportant in predicting output and debt service in this

system.

Figure 3. Impulse in Capital Inflow Equation



Note: *Cum* indicates accumulated responses of the variables.

8. Conclusions

This paper has investigated the interactions among the debt service, long-term capital inflows and economic growth in Turkey between 1960-1996, using simultaneous equation estimation methods. Even though our results cannot be generalised, the following conclusions are drawn from 3SLS estimation. The relationship between debt service and economic growth should be analysed with a simultaneous equation model, because there is a two-way relationship between debt service and growth. The rise in the debt-servicing ratio adversely affects economic growth whereas the decrease in the rate of growth, reduces the ability of an economy to service its debt. When Turkey is servicing its debt, debt servicing could impair economic growth.

According to our results, debt service is found to be responsive to the lagged debt stock. Servicing a heavy debt may exacerbate the debt problem. In order to service its debt, Turkey had to borrow more. The higher the lagged debt stock the higher the debt service. This result is consistent with the Turkish experience which shows the existence of two way relationships between total debt stock and debt service. In contrast to our expectations, export growth does not affect debt service strongly. One possible explanation is that exports earning tended to become significant as a source of foreign exchange and an engine of growth only after 1980, when the Turkish government began to implement realistic exchange rate and export promotion policies. Capital inflows may have a substantial role in the growth-debt relationship. Capital inflows do not affect economic growth, but it is affected by economic growth. The results indicate that growth rates will not attract more capital inflows. To supplement the controversy about the cause and effect

relationship between economic growth, debt service and capital inflow in Turkey with empirical results, we present the direct effects and total effects of these variables within the simultaneous equation framework. The direct effect of debt service on the economic growth is negative. However, the favourable indirect effects of external debt on economic growth through lowering private investment and overall levels of capital stock are larger than the direct effect. Thus, the total effects of external debt on economic growth are exceeded the direct effects. For the debt service equation, the direct effect of DEB_{t-1} and EXR are larger than the total effect and both effects are the same sign. It is found that the higher the value of export the lower the external debt service. However, in export cases the favourable effects of indirect effects of exports on debt service via the lowering debt burden is large in absolute terms and substantially exceed the direct effects. Hence, the total effect of exports on debt service is negative and smaller than direct effects.

REFERENCES

Afxentiou, P.C. (1993) GNP Growth and foreign indebtedness in middle-income developing countries, *International Economic Journal*, 7(3), pp. 81-92.

Afxentiou, P.C and Serletis, A. (1996) Growth and foreign indebtedness in developing countries : an empirical study using long-term cross- country data, *The Journal of Developing Areas*, 31, Fall, pp. 25-40.

Bullow, J and Rogoff, K (1990) Cleaning up third world debt without getting taken to the cleaners, *Journal of Economic Perspectives*, 4,1, pp. 31-42.

Calvo, G.A, Leiderman L and Reinhart,C .(1996) Inflows of capital to developing countries in the 1990s, from selected countries in Asia and the pacific, *Applied Economics*, 26, pp. 1121-1131.

Ceyhun, F. (1992) Turkey's debt crises in historical perspectives: a critical analysis, *Metu Studies in Development*,19(1), pp.9-49.

Chowdhury, K. (1994) A structural analysis of external debt and economic growth: some evidence from selected countries in Asia and the Pacific, *Applied Economics*, 26, pp.1121- 1131.

Cunningham, R.T. (1993) The effects of debt burden on economic growth in heavily

- indebted nations, *Journal of Economic Development*, 18 (1), June, pp. 115-126.
- Dornik, A.J and Hendry, F.D (1995) PC-GIVE (8.0) *An Interactive Econometric Modelling System* (London, Chapman and Hall).
- Dornik, A.J and Hendry, FD (1994) PC-FIML(8.0) *An Interactive Econometric Modelling System* (London , International Thomson Publishing).
- Feder, G. (1980) Economic Growth, foreign loans and debt servicing capacity of developing countries, *Journal of Development Studies* , 16, pp. 352-368.
- Feder, G.(1982) On exports and economic growth, *Journal of Development Economics*, 12, pp.59-73.
- Fosu, A.K. (1996) The impact of external debt on economic growth in Sub-Saharan Africa, *Journal of Economic Development*, 21 (1), June, pp. 93-118.
- Fry, M.J. (1989) Foreign debt instability: an analysis of national saving and domestic investment responses to foreign debt accumulation in 28 developing countries, *Journal of International Money and Finance*, 8, pp. 315-344.
- Geiger, L.T. (1990) Debt and economic development in Latin America, *The Journal of Developing Areas*, 24, pp.181-194.

Gujarati, D.N. (1995) *Basic Econometrics*, Third Editions (Mcgraw-Hill International Editions).

International Monetary Fund (IMF). *International Financial Statistics Yearbook (various years)*.

Koutsoyiannis, A (1977) *Theory of Econometrics*, Second Edition, (Macmillan).

Levy, A and Chowdhury, K (1993) An integrative analysis of external debt, capital accumulation and production in Latin America, Asia-Pacific and Sub-Saharan Africa, *Journal of Economics and Finance*, 17(3),pp.105-119.

Metwally, M.M and Tamaschke, R. (1994) The interaction among foreign debt, capital flows and growth; case studies, *Journal of Policy Modelling*, 16 (6), pp.597-608.

Morisset, J. (1991) Can debt reduction restore economic growth in highly indebted countries? , *Revue D'economique Politique*, 101, pp.639-666.

Olgun, H. Disbudak, U.and Okem, G. (1998) Macroeconomic interactions among capital inflows, debt servicing and growth, paper presented in *Middle East Technical University (METU) II Economic Conference*, Ankara.

Ram, R (1985) Export and economic growth: some additional evidence, *Journal of Economic Development and Cultural Change*, 33, pp. 415-425.

Rockerbie, D.W. (1994) Did debt crisis cause the investment crisis? Further evidence, *Applied Economics*, 26, pp. 731-738.

Savvides, A. (1992) Investment slowdown in developing countries during the 1980s: debt overhang or foreign capital inflows, *Kyklos*, 45 (3), pp. 363-378.

Sawada, Y. (1994) Are the heavily indebted countries solvent? Tests of inter temporal borrowing constraints, *Journal of Development Economics*, 45, pp. 325-337.

Sims, C. (1980) Macroeconomics and reality, *Econometrica*, 48, pp.1-48.

State Planing Organisations. (1998) *Economic and Social Indicators, 1950-1998*, (Ankara, Turkey).

State Institute of Statistics, Turkey (1993) *Statistical Indicators 1923-1991*, (Ankara, Turkey.)

State Institute of Statistics, Turkey (1994) *Gross National Product, Concepts, Methods and Sources*, (Ankara, Turkey).

State Institute of Statistics, Turkey (1994) *Gross National Product, Concepts, Methods and Sources*, (Ankara, Turkey).

State Institute of Statistics, Turkey (1996) *Turkish Economy, Statistics and Analysis, July-August 1995*, (Ankara, Turkey).

State Planing Organisations (1998) *Economic and Social Indicators, 1950-1998*, (Ankara, Turkey).

Under Secretariat of Treasury (1992) *External Debt Bulletin*, (Ankara, Turkey)

