IMPACT OF TRDE LIBERALIZATION ON ECONOMIC GROWTH OF SRI LANKA: AN ECONOMETRIC INVESTIGATION

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ABSTRACT

This paper examines impact of trade liberalization on economic growth of Sri Lanka. The research problem is expressed as "To what extent does trade liberalization or openness of the economy influence on economic growth of Sri Lanka?" The primary objective of the study is to investigate the causal relationships between the trade liberalization and economic growth of Sri Lanka. The study is mainly based on secondary data. In identifying the impacts of trade liberalization on growth and trade balance, data were collected on a specific time interval before and after the trade liberalization. The time period selected is from 1960 to 2007. To identify the impacts of trade liberalization, total time period is divided into two sub periods of before trade liberalization i.e. (1960 to 1976) and after trade liberalization i.e. (1977 to 20070). Since the study is based on secondary data, basically it is uses data published in annual reports of Central Bank of Sri Lanka. The variables identified in the main objective of the study are tested hypothetically, and quantitative analytical methods are applied to make accurate and reliable conclusions. Therefore, graphical presentations and regression analysis are used to assess the degree of relationships among variables concerned. Further to test the structural changes of the country, the Chow test is applied. Findings of the study confirm a significant positive relationship between trade liberalization and economic growth of Sri Lanka. The result of Chow test proves a clear change of economic growth before and after trade liberalization of the country.

Key Words: Trade Liberalization, Economic Growth, Investment, trade policies

INTRODUCTION

Trade liberalization of economies via the reduction or complete elimination of trade barriers has become the most popular economic policy of developed and developing countries today. Import and export tariffs, quotas, export subsidies, technical barriers are the popular trade barriers which have been used during the last few decades. However with globalization of world economies all most all the counties in the world are actively involved with reducing trade barriers among their trade partners. Major objective of moving towards free trade is to achieve macroeconomic goals of their economies. Basically to achieve high economic growth developing economies are implementing free trade policies during the last few decades. As a result of that trade openness has been widening up in these economies. In the last three decades, trade liberalization increasingly

evolved with the expectation of rapid economic growth in Sri Lanka.

Problem Statement

Researchers have investigated to answer the question of how the trade liberalization is linked with economic growth of a country. However researches carried out on this field have produced a mixed bag of results all over the world. These results have created the issue more complex in the world. Therefore this study attempts to find empirical evidences on the relationship between international trade and economic growth of Sri Lanka. Formally, the research problem is expressed as "To what extent does free trade influence on economic growth of Sri Lanka. More specifically following research questions will be addressed by the study.

1. What has been the effect of liberalization on economic growth of Sri Lanka?
2. What has been the effect of trade liberalization on export and import growth in Sri Lanka?
3. Has the impact of liberalization been greater on export growth or import growth?
4. What has been the effect of trade liberalization on Sri Lanka's investment level?

Objectives of the Study

The primary objective of the study is to investigate the relationships between the trade liberalization and economic of Sri Lanka. Therefore, the study investigates more specifically on the contribution made by the international trade on economic growth, investment level, exports and imports of Sri Lanka.

According to the said specific objectives, the study has been carried out with the use of hypotheses and they are as follows.

Hypothesis One (H$_1$)   :
There is a positive relationship between trade liberalization and economic growth.

Hypothesis Two (H$_2$)   :
Trade liberalization has improved the investment level of the of Sri Lanka

Hypothesis Three (H$_3$) :
Trade liberalization has increased the total exports and imports of Sri Lanka

LITERATURE REVIEW

There are large number of studies which have been carried out to find the relationship between economic growth and trade liberalization. However findings of these studies tend to give conflicting results. Some studies have shown that trade liberalization has increased the performance of export and ultimately increasing the national income. On the other hand, some studies have shown little evidence to prove strong relationship between trade liberalization and economic growth of world economies.

Attempts to measure relationship between trade liberalization and economic growth go back to decades. However until recently most studies which were carried out on finding relationship between these two variables depended on the comparison of gross domestic growth between closed and opened economies or before and after trade liberalization. Two examples of before and after approach or called event studies are publication of World Bank (Nash and Thomas,1991; and Papageorgiou et al 1991). These studies have identified a year of liberalization and after observing higher GDP growth

rate after the reforms and concluded that trade liberalization leads to higher growth. However major limitation of this approach is that it doesn't control other factors that may affect to boost economic growth after trade liberalization. For example some time an economy may liberalize trade and at the same time it may exit from a communist regime. Also when the liberalization take place country may recover from a short – term recession. Therefore event studies have shown some major drawbacks when measuring the degree of relationship between trade and economic growth.

In a major study of trade orientation, distortions and growth in developing countries, Edwards (1992) develops a model which assumes more open economies are more efficient at absorbing exogenously generated technology. Using various indicators of trade orientation constructed by Leamer (1988), he shows for a sample of 30 developing countries over the period 1970-82, that more open economies tend to grow faster. To test the hypothesis, a conventional growth equation is used relating the growth of per capita income of countries to their investment ratio; to their initial level of per capita income as a proxy for technological backwardness, and a measure of trade distortion. All but one of the trade distortion measures produce a significant negative coefficient, and the findings are robust with respect to the sample taken, the time period taken and the method of estimation. The findings are also robust to some of the alternative indicators of trade liberalization and distortion mentioned at the beginning. In Edward's model, however, the only channel through which trade liberalization enhances growth is the absorption of foreign technology. This is undoubtedly important, but there are other important mechanisms.

In a similar study for 93 developed and developing countries over the period 1960-90, Edwards (1998) regresses total factor productivity growth separately on nine indicators of openness listed earlier, and six turn out to be significant with the expected sign. Edwards concludes "these results are quite remarkable, suggesting with tremendous consistency that there is a significantly positive relationship between openness and productivity growth". Rodriguez and Rodrick (2000) criticize the estimation method used of weighted least squares where the weighting variable is a country's per capita income. This gives a weight to the US one-hundred times that of the poorest country in the sample. Using more reasonable weights (i.e. with variables measured in logarithms), Edward's results lose much of their significance. Of the nineteen different equations reported, only three are now statistically significant. Rodriguez and Rodrick conclude "we do not concur with Edward's assertion that the cross-country data reveal the existence of a robust relationship between openness and productivity of GDP growth".

Another major study of trade orientation and growth is that by Sachs and Warner (1995), taking 79 countries over the period 1979-89. They apply the dummy variable technique of giving a country a zero value if it closed and a value of 1 if it is open, using the five criteria mentioned earlier. It is found that open economies grew on average by 2.44 percentage points faster than closed economies. Rodriguez and Rodrick claim, however, that it is not tariffs and non-tariff barriers that distinguish the two sets of countries but a combination of the black market premium exchange rate and the state monopoly of exports. The former is highly correlated with turbulent macroeconomic conditions and the latter with location in Africa (the slowest growing continent). All the

countries with a black market premium in excess of 20 percent had serious problems of inflation, debt, and terms of trade deterioration or war.

To find out the trade liberalization and economic performance of countries the World Bank(WB) classified a group of 41 countries based on different degrees of outward and inward orientation in 1987. Four categories identified by the World Bank are Strongly outward oriented, Moderately outward oriented, Moderately inward oriented Strongly inward oriented countries. According to the World Bank study it concluded that economic performance of the outward-oriented economies has been broadly superior to that of inward-oriented economies in all respects.

Aksoy and Salinas (2004) have carried out a study to investigate the relationship between economic growth before and after trade liberalization of world economies. The sample of the study constituted with 39 developing countries. The study has used time series data for the period of 34 years from 1970 to 2004. According to the study of Aksoy and Salinas they have identified that post – reform economic growth of sample countries was 1.2 percent higher than before the reforms. Moreover this study investigated that trade liberalization has been followed by acceleration in investment, exports of goods and services, and manufacturing exports, and as opposed to common belief, outward orientation did not lead to significant deindustrialization and actually seems to have increased export diversification. Further study has identified that small countries have benefited more from the trade reforms.

According to Balassa (1978), he has found a positive relation between an outward oriented regime and economic growth by observing countries that experience higher exports growth with a significantly higher economic growth even after removing exports from GDP accounting. However major point that could be kept in mind that exports growth can be flourished by GDP growth itself or some polices other than trade liberalization. Therefore this relationship may not reveal causality between trade liberalization and growth.

Another vital study carried out on trade liberalization and economic growth is the study of Parikh and Stirbu (2004). For this study Parikh and Stirbu have used panel data of 42 countries from three regions (Asia, Africa and Latin America) and have used country by country analysis (OLS regression).This study has used the latest available data on real GDP, growth rates of individual and advanced countries and examined the relationship between liberalization and growth, liberalization and trade balance and also the impact of exchange rate or terms of trade policies on trade balance. Findings of this study suggest that trade liberalization promotes growth but growth itself has negative effect on trade balance for a large majority of countries. Further study has investigated that one unit change in liberalization index leads on average to 1.62 percentage point change in growth rates one average , ceteris paribus. However, this country level study had not permit to reach unambiguous conclusions. Because for five countries of the sample have had a positive and significant effect while for twelve countries, trade balance tends o worsen with liberalization. Somehow further this study suggests that liberalization had a positive effect on growth in many economies.

However according to the study carried out by Sarkar (2005) has found no meaningful relationship between the growth rate of real GDP or per capita real GDP and trade openness. The study

has been based on two countries in Asian region, India and Korea. According to this study, in the first stage of simple trend analysis, it has been observed that both countries, India and Korea, opened up and consequently shares of trade in their GDPs rose significantly. The process of opening up of accelerated in India and decelerated in Korea after 1973. The study has identified that real growth rates of both India and Korea has been fluctuated and there has been some evidence of a rise in Indian real growth rates after post liberalization period. However the GDP and per capita GDP growth rate has been swelled in Korea at a rapid rate up to the beginning of the 1970s and fell subsequently. To identify the deterministic trend of variables Sarkar has employed two tests of stationarity called Augmented Dicky – Fuller tests and perron tests. Those tests have exhibited that the series did not have deterministic trends so that temporary shocks could have permanent effects. Moreover the study has found no positive relationship between opening up and economic growth. Contrary to the expectations in the pro-liberalization circle, Sarkar has found a large negative relationship between trade openness and growth keeping calls for further investigation to explain such paradoxical finding.

According to Nath and Mamun (2004) there is some evidence of trade liberalization accelerating growth in Bangladesh. Also they have suggested that trade openness has promoted investment in Bangladesh. However study suggests a little evidence of trade affecting income distribution or of income distribution affecting growth or investment in Bangladesh.

In a major study of trade orientation, distortions and growth in developing countries, Edwards (1992) develops a model which assumes that more open economies are more efficient at absorbing exogenously generated technology. Using nine indicators of trade orientation constructed by Leamer (1988), he shows for a sample of 30 developing countries over the period 1970-82, that more open economies tend to grow faster. To test the hypothesis, a conventional growth equation is used relating the growth of per capita income of countries to their investment ratio; their initial level of per capita income as a proxy for technological backwardness, and a measure of trade distortion.

According to Andesen and Babula (2008), they also have found a link between openness and long run economic growth of countries. They have reviewed the most cited empirical analyses of the relationship between international trade and economic growth and more empirical analyses of the link between trade and productivity growth. In their study they have concluded that there is likely to be a positive relationship between international trade and economic growth. However they have cited two caveats. First, they have concerned about the way problems of measurement error and endogeneity are handled in much of the empirical literature. The second caveat relates to the ability of developing countries to gain productivity growth through trade liberalization. To do so they have recommended to invest in, e.g., education facilities, to ensure property rights and to build up institutions.

METHODOLOGY

The study is mainly based on secondary data. In identifying the impacts of trade liberalization on economic growth data were collected on a specific time interval before and after the liberalization of international trade in Sri Lanka. The time period selected is from 1960 to 2007.

Further to identify the impacts of trade liberalization, total time period is divided into two sub periods of before trade liberalization i.e. (1960 to 1976) and after trade liberalization i.e. (1977 to 2007).

Data Collection

Since the study is based on secondary data, basically it uses data published in annual reports of Central Bank of Sri Lanka (CBSL). As the study is based on time series data, price effects of variables are removed by using GDP deflator of respective years. Therefore, the price effects of Gross Domestic Product, total exports and imports are divided by GDP deflator to remove the inflationary effects of those variables.

Methods of Data Analysis

The variables identified in the main objective of the study are tested hypothetically, and quantitative analytical methods are applied to make accurate and reliable conclusions. Therefore, simple statistical techniques as well as advanced statistical methods are applied in the study. Descriptive statistical techniques, simple and multiple regression analysis are used to assess the degree of relationships among variables concerned. Further to test the structural changes in pre liberalized and post liberalized periods of international trade in the country, Chow test is applied.

Specifications of Simple and Multiple Regression Model

The study uses ordinary least square (OLS) method to derive simple and multiple regression models which are used to analyze the impacts of trade liberalization. The study uses simple regression model as far as possible to avoid the complexity of the models.

Hence, to examine the effects of trade liberalization on growth following equations are mainly used in the study.

GR = f (LIBER)
GDP = f (t)
EXPO = f (t)
IMPO = (t)
INTERM =f (t)
INVESM = f (t)
I = f (LIBER)

Where, GR refers to economic growth, LIBER refers to trade liberalization, t refers to time, GDP refers to gross domestic product, I refers to investment, EXPO refers to total exports, IMPO refers to total imports, INTERM refers to intermediate goods imports, INVESM refers to investment goods imports.

Measuring Growth Rate of a Variable

The study uses linear log model in measuring growth rate of gross domestic product and annual trade balance of Sri Lanka. Growth rate of a certain economic variable can be measured by applying simple regression technique. Suppose that it is required to measure the growth rate of variable Y. According to the compound interest formula, it can be written down as follows.

$$Y_t = Y_0 (1+r)^t \text{---------------------- (1)}$$

Where, r is the compound (i.e. over time) rate of growth of variable Y. By taking natural logarithm of formula 1, it can be stated as in equation 2.

$$\ln Y_t = \ln Y_0 + \ln (1+r) \text{------------(2)}$$

Letting;

$$\beta_1 = \ln Y_0$$
$$\beta_2 = \ln (1 + r)$$

The equation 2 can be rewritten as,

$$\ln Y_t = \beta_1 + \beta_2 t \text{------------------(3)}$$

By adding error term (disturbance term) to equation 3, it can be re arranged the equation 3 and presented in equation 4.

$$\ln Y_t = \beta_1 + \beta_2 t + u_t \text{--------------(4)}$$

The model shown in equation 4 is similar to any other linear regression model and regression coefficients or parameters, β_1 and β_2 are considered as linear. The only difference of the regression model given in equation 4 is that dependent variable is in the form of logarithm of Y and the independent variable is "time". The independent variable that is *time*, takes values of 1, 2, 3, 4…etc. In the formula shown in equation 4, only one variable is appearing in the logarithm form. Therefore in econometrics, the model that is explained in equation 4 is called *semi log model*. In this particular model as only the independent variable is on logarithmic form it is called **a log-lin model** (Gujarati, 2004). The properties of *log-lin model* can be traced as follows.

In equation 3, the slope coefficient measures the constant proportional or relative change in dependent variable (Y) for a given absolute change in the value of the independent variable. In this study, lin – log model is applied to measure the growth rate of GDP and trade balance and time (t) is taken as the independent variable. Therefore slope coefficient of model 3 can be written down descriptively as follows.

$$\beta_2 = \frac{Relative\ Change\ in\ Dependent\ Variable}{Absolute\ Change\ in\ Independent\ Variable} \text{---(5)}$$

In equation 5, if numerator is multiplied by 100 it will give the growth rate of dependent variable(Y) for an absolute change in independent variable (X). The product of β_2 of the relevant model and 100 is known as the growth rate of the dependent variable.

DATA ANALYSIS

Impact of trade liberalization on economic growth is assessed by comparing economic condition prevailed before and after trade liberalization during the period from 1960 to 2007. Behavior of major variables is analyzed by using descriptive statistical measures and graphical presentation method. Basically, behavior of major variables such as Gross Domestic Product (GDP), exports, imports etc. were summarized and presented by using bar charts, and descriptive statistics. Also data for Gross Domestic Product, exports, imports for the period 1960 – 2007 are collected and analyzed by using simple and multiple regression techniques. Chow test is applied to analyze the structural changes of the Sri Lankan economy during the last five decades. In this study Chow test is applied to examine the structural changes in economic growth of Sri Lanka.

Behavior of Major Variables

It is very much important to get a clear picture on general behavior of major variables concerned in the study. Basically long term trend and oscillations of variables mainly in economic growth, gross domestic product, trade openness measurements, exports and imports variables are essential to study during the pre and post liberalization period.

Economic Growth

Economic growth rates over the last five decades show quite irregular pattern due to internal and external shocks faced by the country. According to the figure 1, when the economic growth rate is concerned before 1977, it shows an uneven pattern of that variable. Sri Lanka has experienced a lower average economic growth rate during the period

from 1960 – 1976. Of which, period from 1970 -1976 country has shown a poor economic performance. This period is especially well known as the most trade restricted period of the economy. For example country has grown at a 0.2 percent in the year 1971. With compared to the economic performance during the 1960s and 1970s this economic growth rate is the lowest rate prevailed in the economy. Besides few years it shows a higher growth rate after trade liberalization with compared to 1960 – 1976 period which is generally known as closed economic period or trade restricted period. However when the country was suffering from heavy civil unrest like in the period of 1987 - 89, economic growth has been fallen down to a very low level. Also, in 2001 Sri Lanka has experienced a negative economic growth of -1.5 percent due to terrorist attack that was happened in Capital of the country. However as a whole, country has performed well after 1977 with compared to the period before 1977.

Figure 1
Economic Growth Rate of Sri Lanka
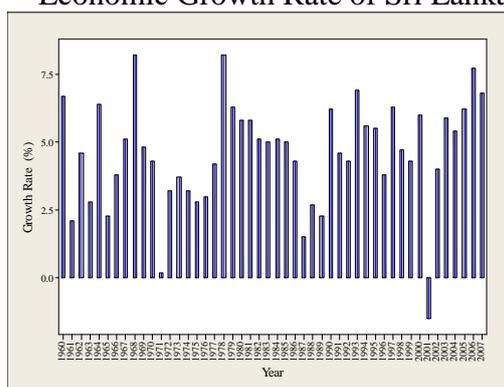
Source: Annual Reports of Central Bank of Sri Lanka

Table 1 shows average growth rates for several sub periods of Sri Lanka. According to the table 1, country has experienced the lowest growth rate during the 1971 -1976 period. Average economic growth rate of that period is only 2.68 percent. The second lowest

economic growth has recorded in 1986 - 1990 period and it is 3.4 percent. During this period, the country has faced civil unrest situation in the country. However after 1977, except the said period, from 1986-1990, country has grown annually at a growth rate of 5 percent.

Table 1
Average Growth Rates for sub periods in Sri Lanka

Period	Average Growth Rate
1960 - 1965	4.15
1966 - 1970	5.24
1971 - 1976	2.68
1977 - 1985	5.61
1986 - 1990	3.40
1991 - 2000	5.20
2001 - 2007	5.06

Source: Annual Reports of Central Bank of Sri Lanka

Trade Openness Measurements

In the study, three measurements are used to quantify the trade openness of Sri Lanka. Those well-known measurements to assess trade openness are ratio of total exports to gross domestic product(X/GDP), imports to gross domestic product(M/GDP) and total of exports and imports to gross domestic products(X+M/GDP). With trade liberalization these measurements are expected to increase over time. In Sri Lanka behavior of three variables over the two periods, restricted economic era and liberalized economic era, are shown in figure 2.

Figure 2 shows the results of trade policy changes during the last five decades. During the closed economic period from 1960 to 1977, all trade openness indicators are showing falling trends. Particularly gap between two indicators imports to GDP and exports to GDP

ratios are very smaller during the restricted economic scenario. However, after 1977 with trade liberalization, it can be seen a dramatic increase of those two measurements by making a considerable gap between two indicators. With rapid increase of total imports relative to the increase of total exports has increased the gap between these two measurements. However, at the very beginning of trade liberalization although exports to GDP and imports to GDP were dramatically increased after that those trade openness measurements show downward trend. As a whole, after 1977, absolute annual amounts of exports and imports increased at an increasing rate. But relative amounts of those two variables have shown a slightly declining trend.

Figure 2
Behavior of Trade Openness Measurements
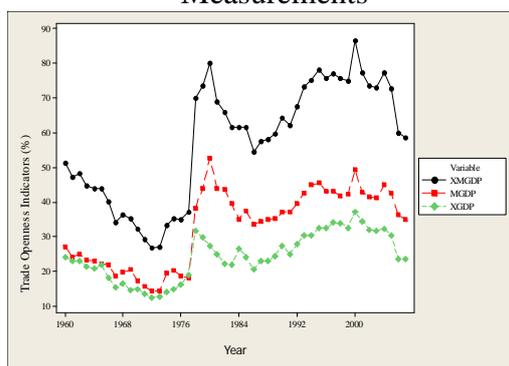
Source: Annual Reports of Central Bank of Sri Lanka

Regression Analysis

To measure the impact of trade liberalization on economic growth of Sri Lanka, simple and multiple regression analysis are applied. Firstly, to measure the impacts of trade liberalization on economic growth simple regression model is applied for two different policy regimes, before and after trade liberalization. To measure the growth rate of dependent variables such as gross domestic products, trade balance and current account balance the Log-Linear

Model of regression is used. In Simple regression analysis direct relationship between dependent and one independent variable is measured. In this research, simple regression model is constructed with use of Ordinary Least Square (OLS) method.

One of the major objectives of the study is to assess the degree of relationship between economic growth and trade liberalization of Sri Lanka. Hence to find out the direct relationship, a simple regression is applied between these two variables for the period from 1960 to 2007. In this context, simple regression is applied using economic growth as the dependent variable and trade liberalization as the independent variable. The regression model is formed by using economic growth as an interval level measurement and trade liberalization as a categorical variable. Hence trade liberalization is used in the regression as a dummy variable.

Table 2
Economic Growth (GR) versus Trade Liberalization (LIBER)

Time Period	R	Constant	Slope
1960-2007	0.452	3.48 (0.435)	
			1.73 (0.511)

Note: Standard error is given in parentheses

Table 2 shows the causal relationship between economic growth and trade liberalization. Correlation coefficient of economic growth and trade liberalization is 0.452 and shows a moderate positive relationship between two variables. Goodness of fit can be interpreted by using the value of coefficient of determinant (R^2) of this regression model and shows a moderate value which is equal to 0.204. Individual regression parameters (intercept and slope) are significant at 1 percent level of

significance (for intercept p-value < 0.01 and for slope coefficient p-value < 0.01). Also overall model is significant at 1 percent level of significance (p-value < 0.01). Further Durbin Watson (DW) statistic describes that the regression model is free from autocorrelation as its value is closer to 2(See Appendix A). According to the regression result, the intercept of the regression model is 3.48 and slope coefficient is 1.73. The intercept of the model describes the average GDP growth of the country during closed economic period from 1960 – 1976 period. Average growth during the closed economic period is 3.48 percent. The slope coefficient of the model explains the impact of trade liberalization on economic growth and it shows that trade liberalization has accelerated the economic growth by 1.73 percent. Hence with trade liberalization, economy has achieved on average 5.21 percent economic growth during the 1977 – 2007 period.

Table 3
Gross Domestic Product versus Time

Time Period	R	Constant	Slope
1960-1976	0.993	11.9 (0.012)	0.0391 (0.001)
1970-1976	0.990	12.3 (0.008)	0.0283 (0.002)
1977-2007	0.993	12.5 (0.019)	0.047 (0.001)

Note: Standard errors are given in parentheses

The rate of growth of gross domestic product over pre and post liberalization period is estimated using log-linear regression model. To identify the growth rate effect of GDP in different policy regimes, total time period (1960-2007) is divided into two sub periods. One period is from 1960 to 1976 and the second period is from 1977 - 2007. Further to measure the growth rate of GDP in most restricted period in the country, it is taken another sub time period from 1970 to 1976.

According to the table 3, correlation coefficients (R) for regression models are higher than 0.98. They show a strong positive relationship between GDP and time variable. Simple regression models derived for three different time periods depict higher coefficient of determination values. Coefficients of Determination (R^2) for regressions estimated for periods 1960-76, 1977-2007 and 1977 -2007 are 0.987, 0.980 and 0.986 respectively. Therefore it is clear that more than 98 percent of total variation of GDP is explained by each regression model. Individual and overall significance of regression coefficients are fulfilled at 1 percent level of significance. Further Durbin Watson (DW) statistic describes that all three regression models are free from autocorrelation as their Durbin Watson statistics are closer to value of 2 (See Appendix B). According to the each equation, slope coefficients of all three regressions describe GDP growth rates for three different time periods. Slope coefficients for three time periods, 1960 -1976, 1970 -1976 and 1977 -2007 are 0.0391, 0.0283 and 0.047 respectively. Therefore during the period from 1960-1976, GDP of Sri Lanka has grown at a rate of 3.91 percent. However during the most restricted period starting from 1970 to 1976, growth rate of Gross Domestic Product has fallen to 2.83 percent. With trade liberalization in 1977 growth rate of Gross Domestic Product has climbed to 4.7 percent in Sri Lanka. As a whole it is proved that country has achieved higher economic growth after 1977 with trade liberalization.

Higher investment of a nation can accelerate economic growth of that

country. Hence it is important to assess the relationship between investment and liberalization of a country and the simple regression result is shown in table 4.

Table 4
Investment (I) versus Trade Liberalization (LIBER)

Time Period	R	Constant	Slope
1960-2007	0.697	15.623 (1.090)	
			8.356 (1.282)

Note: Standard errors are given in parentheses

Summary presented in table 4 shows a good relationship between investment and trade liberalization dummy variable. Regression result depicts a positive relationship between trade liberalization and investment level of Sri Lanka. Correlation coefficient of two variables is 0.697and shows a moderate relationship. Also higher t-statistic and F ratio indicate the significance of individual coefficients and overall significance of the model. According to the P – value approach it is quite clear that individual and overall significance has been fulfilled in the model. Further it explains that individual coefficients of the regression model are significance at 1 percent level of significance (for intercept p-value < 0.01 and for slope coefficient p-value < 0.01). Also overall model is significant at 1 per cent level of significance (p-value < 0.01) (See Appendix C). According to the simple regression result it shows that trade liberalization has increased the investment ratio of Sri Lanka by 08 percent. As a result of that after trade liberalization, Sri Lanka's investment level has been increased up to 24 percent approximately with compared to the 16 percent investment level prevailed in the closed economic period in the country.

Figure 3
Export earnings during two trade Regimes

$EXPO = 37265 - 454\ t$

$R^2 = 0.496$

(i)

$EXPO = 29020 + 9751\ t$

$R^2 = 0.931$
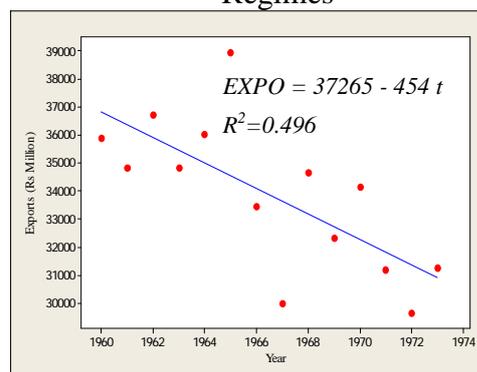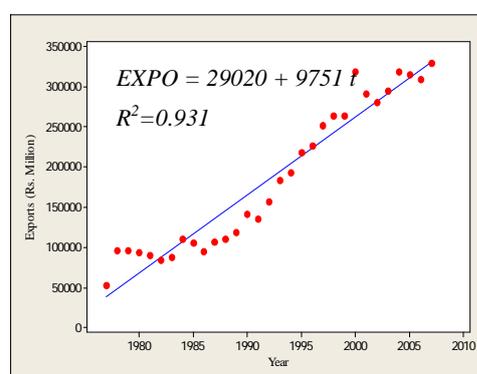
(ii)

Long term movement of total exports shows the general trend of that variable. In time series data set, long term trend can be derived by regressing relevant variable against time variable and sign of slope coefficient of that simple regression line shows whether the variable has an upward trend or downward trend. Also slope coefficient of that simple regression model shows the rate of change of the variable. The general movement or long term trend of the total export variable for two trade regimes (restricted and free) is derived by regressing total export variable against time variable. The result of the simple regression is shown figure 6. The causal relationship between export and time variable of regression result is presented in figure 3. Correlation coefficient for period 1960 -1976 is - 0.704 and it shows a moderate negative relationship between exports and time

variable. Correlation coefficient for period 1977 to 2007 is 0.965 and shows a strong positive relationship between exports and time variable. Coefficients of Determination (R^2) for regressions estimated for periods 1960-76, 1977-2007 are 0.496, and 0.931 respectively. All Individual regression parameters (intercept and slope) of simple regressions for two time periods are significant at 1 percent level of significance (for intercept p-value < 0.01 and for slope coefficient p-value < 0.01) and each overall model is significant at 1 percent level of significance (p-value < 0.01) (See Appendix D).

Figure 3 shows significant difference of the behavior of total exports of Sri Lanka before the trade liberalization and after the trade liberalization. Panel (i) of Figure 3 shows the behavior of export earnings during the closed economic era before 1977 and it shows that total exports have been declined by 454 million of rupees by annually. However panel (ii) of Figure 3 shows that annual total exports have been increased by Rs. 9751 million after trade liberalization.

The relationship between total imports and time variable of regression result is shown in figure 4. Slope coefficients for 1960-1976 and 1977 – 2007 are 505.4 and 12651.4 respectively. Signs of slope coefficients of two regression line shows long term trend for two periods. During the 1960 – 1976 period, total imports of the country has been increased marginally due to heavy trade restrictions on imports of the country. Annually total imports has been increased by rupees 505 million only. This increase is a marginal increase of the imports of the country. However, with trade liberalization in 1977 this pattern has been dramatically changed in the country (See Appendix E).

In the 1976 -1977 period annual imports of the country has been increased by rupees 12,651 million. This increase of total imports might be a result of decrease and complete elimination of trade barriers of the country. This complete elimination or at least decrease of trade barriers during 1977 -2007 period may have induced to increase the imports of intermediate and investment goods by ultimately increasing the total imports of the country.

Figure 4
Total Imports during two trade Regimes

$$IMPO = 36189 + 505\,t$$
$$R^2 = 0.219$$

(i)

$$IMPO = 57351 + 12651\,t$$
$$R^2 = 0.924$$
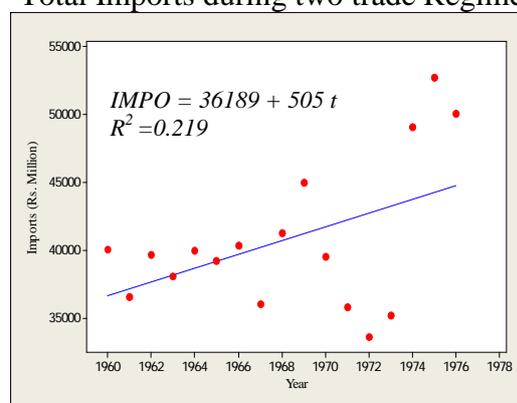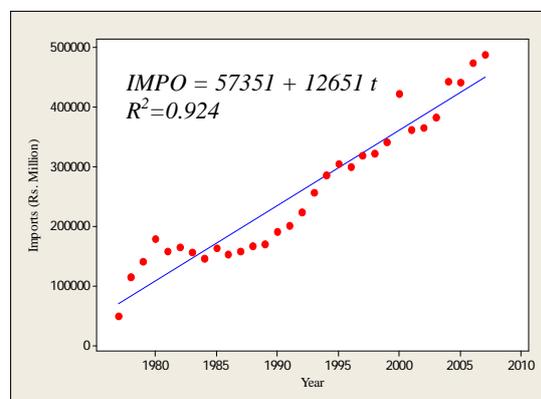
(ii)

Further figure 4 shows significant difference of the long term trend of total imports of Sri Lanka during the pre and post liberalization periods. Panel (i) of Figure 4 shows the long term trend of total imports during the closed economic era before 1977. Panel (ii) of Figure 4 shows the long term trend of total

imports after trade liberalization in 1977. With compared to the long term trend in panel (i) of figure 4, panel (ii) shows a steeper trend line permitting to interpret high increase of total imports during the trade liberalization era.

The general movement of the intermediate goods imports for two trade regimes is derived by regressing total intermediate goods imports against time variable. The result of the simple regression is shown in figure 5.

Slope coefficients for period one (1960-1976) and period two (1977 – 2007), are 1036 and 7842 respectively. Signs of slope coefficients shows long term trend for two periods. They show an upward trend for both periods. Further, importation of intermediate goods has increased annually by rupees 1036 million in the 1960-1976 period while annual increase in 1977 -2007 period is rupees 7842 million. Hence, during the 1977 -2007 period, intermediate goods importation has been dramatically increased with compared to the period 1960 -1976(See Appendix F).

Further figure 5 shows significant difference of the long term trend of intermediate goods imports during the pre and post liberalization periods. Panel (i) of Figure 5 shows the long term trend of intermediate goods imports during the closed economic era and panel (ii) shows the long term trend of intermediate goods imports after trade liberalization in 1977. With compared to the long term trend in panel (i) , panel (ii) shows a steeper trend line permitting to interpret high increase of intermediate goods imports during the trade liberalization era.

Figure 5
Intermediate Goods Imports (INTERM)
during two trade Regimes

$INTERM = -1280 + 1036t$
$R^2 = 0.616$

(i)

$INTERM = 16220 + 7842\,t$
$R^2 = 0.941$

(ii)
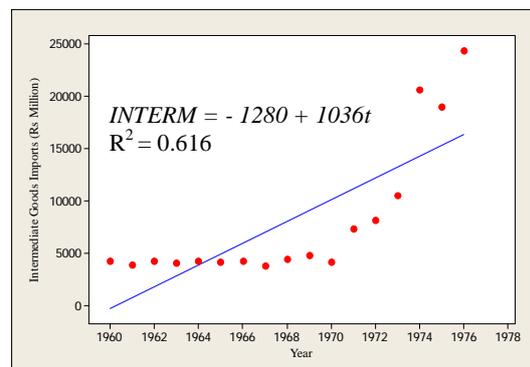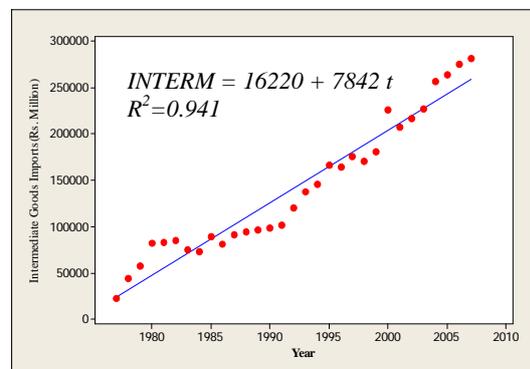
Figure 6 shows the results of simple regression models used to measure the general movement of total investment goods imports over two periods. Regressions derived for two periods are period one from 1960 - 1976 and period two from 1977 to 2007. Slope coefficients for period 1960-1976 and period 1977 – 2007, are -644.2 and 2742.9 respectively. Signs of slope coefficients shows long term trend for two periods. They show a downward trend of imports of investment goods imports for period one and upward trend for period two. Hence investment goods imports have decreased annually at a rate of rupees 644 million during 1960 -1976 period. However, after 1977 investment goods imports have increased dramatically at a rate of rupees 2743 million (See Appendix G).

Figure 6
Investment Goods Imports (INVSEM) during two trade Regimes
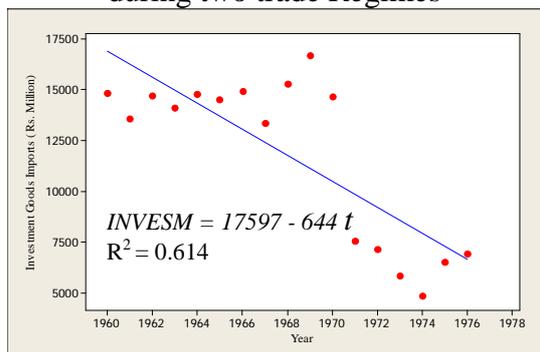
(i)

(ii)
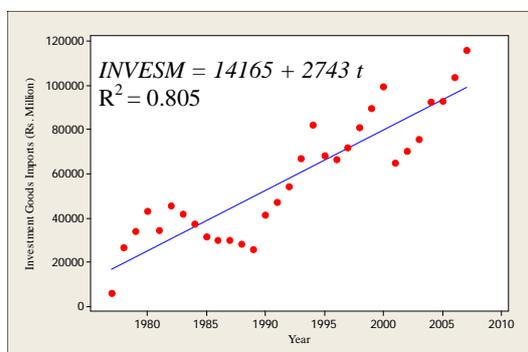
Figure 6 shows the long term trend of investment goods imports during the pre and post liberalization periods. Panel (i) of Figure 6 shows downward trend of investment goods imports during the closed economic era before 1977. Panel (ii) of Figure 6 shows the upward trend of investment goods imports after trade liberalization in 1977.

Hypothesis Testing for Structural Changes in Trade Liberalization and Economic Growth Relationship

Chow test is applied to examine the structural changes in growth of Gross Domestic Product during the two trade policy regimes, closed economic era and open economic era. In applying Chow Test to examine whether there is any significant difference in economic growth rates of restricted economic era (from 1960 to 1976) and open economic era (from 1977 to 2007) total time period (from 1960 to 2007) is divided into two periods. Period one is considered as the closed economic period from 1960 to 1976 and period two is considered as liberalized economic period from 1977 to 2007. After that, by taking time as the independent variable and GDP as the dependent variable simple regression models are constructed for said periods. Further to apply Chow test, simple regression modal also is constructed for total time period considered in this research.

Hence three different time periods used to estimate the growth rates are;

Period 1----------------From 1960 to 1976
Period 2----------------From 1977 to 2007
Period 3----------------From 1960 to 2007

In this study, GDP growth rates for three periods are computed by applying log-linear regression model. Estimated regression models for above three periods are given by following three equations.

For Period 1:

$$\ln GDP = 11.8656 + 0.039125T \text{--- (6)}$$
$$(0.0118) \quad (0.001149)$$
$$R^2 = 0.987 \quad RSS_1 = 0.00808 \quad df = 15$$

For Period 2:

$$\ln GDP = 12.5272 + 0.047109T \text{---(7)}$$
$$(0.0190) \quad (0.001039)$$
$$R^2 = 0.986 \quad RSS_2 = 0.0776 \quad df = 29$$

For Period 3:

$$\ln GDP = 11.8061 + 0.0448271T \text{-(8)}$$
$$(0.0146) \quad (0.0005178)$$
$$R^2 = 0.994 \quad RSS_3 = 0.114 \quad df = 46$$

Two hypothesis built up to test structural changes are;

Null Hypothesis (H$_0$) :

Parameter Stability is there

Alternative Hypothesis (H$_1$) :

Parameter Stability is not there

The two hypotheses are tested by comparing Calculated F value (F$_c$) and F table value (F$_t$). Decision rule to accept or reject null hypothesis is,

if $F_c < F_t$, null hypothesis is accepted and alternative hypothesis is rejected

if $F_c > F_t$, null hypothesis is rejected and accepted alterative hypothesis.

F$_c$ statistic is calculated by using the formula given in equation 9.

$$F_c = \frac{[(RSS_R - RSS_{UR})/K]}{RSS_{UR}/(n_1 + n_2 - 2k)} \ldots\ldots F_{[k,(n_1+n_2-2k)]} \quad (9)$$

Where

RSS$_R$ = Restricted residual sum of square
RSS$_{UR}$ = Un-restricted residual sum of square
K = Number of parameters estimated
n$_1$ = number of observations of period 1
n$_2$ = number of observations of period 2

Based on simple regression models values for each term appeared in formula 9 are given below.

K = 2, n$_1$= 17, n$_2$ = 31
RSS$_3$= RSS$_R$ =0.114
RSS$_1$ + RSS$_2$ =RSS$_U$ = 0.00808 +0.0776
= 0.08568

$$F_c = \frac{[(RSS_R - RSS_{UR})/K]}{RSS_{UR}/(n_1 + n_2 - 2k)}$$

$$F_c = \frac{[(6.114 - 0.08568)/2]}{0.0568/(17 + 31 - 2*2)}$$

$$F_c = \left[\frac{[0.02832/2]}{0.08568/44} \right]$$

$$\underline{\underline{F_c = 7.2717}}$$

According to the above calculation calculated F value (F$_c$) is 7.2717.

Figure 7
Region of rejection and non-rejection of null hypothesis
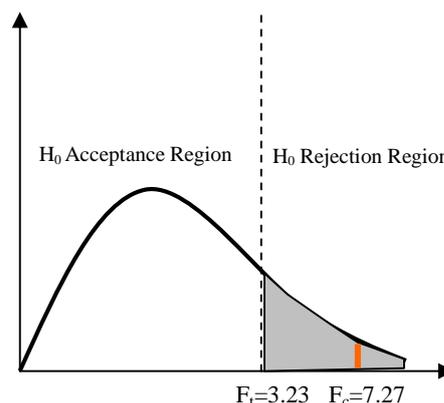
With $V_1 = 2$ and $V_2 = 44$ and at 5 % level of significance F-table value is equal to 3.23. As the calculated value (F$_c$ = 7.27) is greater than F – table value (F$_t$ =3.23) null hypothesis is rejected. Rejection of null hypothesis concludes that structural changes in GDP growth rates have been happened during the last five decades due to trade liberalization. Further it concludes that country has experience higher economic growth after trade liberalization period than pre liberalization period.

CONCLUSION

The study encompassed five decades which belong to two trade regimes, pre and post liberalization period, in Sri Lanka. Findings of the present study are on the relationships between trade liberalization, economic growth of Sri Lanka. And also other factors affecting these relationships are taken into consideration in the study.

One of the major hypotheses of the study is to test the relationship between trade liberalization and the Sri Lanka's economic growth during the pre and post liberalization era. Findings of the present study confirm a positive significant relationship between trade liberalization and economic growth of the country. The result of Chow test proves a clear change of economic growth before and after trade liberalization of the country. The study shows that liberalization has increased the economic growth of the country by 1.73 percent. During the closed economic period the economic growth has been 3.48 percent and this average economic growth further has been improved by trade liberalization. As a result Sri Lanka has achieved a 5.21 percent average economic growth after trade liberalization of the country. This resulted to increase the average economic growth rate by 1.73 percent with trade liberalization.

Further to assess the robustness of the result, three simple regressions were regressed against time for two trade regimes. The results of simple regression which regressed economic growth against time shows higher growth rate during liberalized trade regime compared to the economic growth in the most restricted period of the country. The country has achieved 2.83 percent economic growth during the 1970 -1976 period. It has climbed up to 4.7 percent during the 1977- 2007 period. This regression analysis also shows that trade liberalization has improved economic growth rate by 1.83 percent. Consequently all statistical results support the conclusion which emphasis positive relationship between economic growth and trade liberalization of the country.

Further, the study has found a strong positive relationship between trade liberalization and investment rate of Sri Lanka. Trade liberalization has promoted the average investment level of Sri Lanka by 8.356 percent. The prevailed investment rate before the trade liberalization was 15.6 percent of GDP. However, with trade liberalization the average investment ratio has been increased up to 24 percent approximately. This is approximately 8.5 percent increase of investment due to the trade liberalization in Sri Lanka. Overall, liberalization has contributed significantly to accelerate economic growth and investment rates over the period of 1977-2007.

APPENDICES

Appendix   A

Regression Analysis: GR versus LIBER

The regression equation is

GR = 3.48 + 1.73 LIBER

47 cases used, 1 cases contain missing values

Predictor	Coef	SE Coef	T	P
Constant	3.4846	0.4346	8.02	0.000
LIBER	1.7330	0.5110	3.39	0.001

S = 1.56707   R-Sq = 20.4%   R-Sq(adj) = 18.6%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	28.245	28.245	11.50	0.001
Residual Error	45	110.506	2.456		
Total	46	138.751			

Durbin-Watson statistic = 1.76088

Appendix   B

Regression Analysis: lnGDP versus t (1960-1976)

The regression equation is

lnGDP = 11.9 + 0.0391 t

Predictor	Coef	SE Coef	T	P
Constant	11.8656	0.0118	1008.07	0.000
t	0.039125	0.001149	34.06	0.000

S = 0.0232025   R-Sq = 98.7%   R-Sq(adj) = 98.6%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.62457	0.62457	1160.13	0.000
Residual Error	15	0.00808	0.00054		
Total	16	0.63264			

Durbin-Watson statistic = 1.605435

Regression Analysis: lnGDP versus T (From 1970 – 1976)

The regression equation is

lnGDP = 12.3 + 0.0283 T

Predictor	Coef	SE Coef	T	P
Constant	12.2992	0.0080	1539.08	0.000
T	0.028282	0.001787	15.83	0.000

S = 0.00945539   R-Sq = 98.0%   R-Sq(adj) = 97.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	0.022396	0.022396	250.50	0.000
Residual Error	5	0.000447	0.000089		
Total	6	0.022843			

Durbin-Watson statistic = 1.78347

Regression Analysis: lnGDP versus t (1977-2007)

The regression equation is

lnGDP = 12.5 + 0.0471 t

Predictor	Coef	SE Coef	T	P
Constant	12.5272	0.0190	657.95	0.000
t	0.047109	0.001039	45.35	0.000

S = 0.0517270   R-Sq = 98.6%   R-Sq(adj) = 98.6%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	5.5038	5.5038	2056.97	0.000
Residual Error	29	0.0776	0.0027		
Total	30	5.5814			

Durbin-Watson statistic = 1.551137

Regression Analysis: lnGDP versus t (1960-2007)

The regression equation is

lnGDP = 11.8 + 0.0448 t

Predictor	Coef	SE Coef	T	P
Constant	11.8061	0.0146	810.13	0.000
t	0.0448271	0.0005178	86.58	0.000

S = 0.0496960   R-Sq = 99.4%   R-Sq(adj) = 99.4%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	18.511	18.511	7495.36	0.000
Residual Error	46	0.114	0.002		
Total	47	18.625			

Durbin-Watson statistic = 0.436905

Appendix   C

Regression Analysis: I versus LIBER (1960-2007)

The regression equation is

I = 15.6 + 8.36 LIBER

47 cases used, 1 cases contain missing values

Predictor	Coef	SE Coef	T	P
Constant	15.623	1.090	14.33	0.000
LIBER	8.356	1.282	6.52	0.000

S = 3.93016   R-Sq = 48.6%   R-Sq(adj) = 47.4%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	656.68	656.68	42.51	0.000
Residual Error	45	695.08	15.45		
Total	46	1351.76			

Durbin-Watson statistic = 0.749296

Appendix   D

Regression Analysis: EXPO versus t (1960-1976)

The regression equation is

EXPO = 37265 - 454 t

Predictor	Coef	SE Coef	T	P
Constant	37265	1125 33.	12	0.000
t	-454.4	132.2	-3.44	0.005

S = 1993.36   R-Sq = 49.6%   R-Sq(adj) = 45.4%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	46981906	46981906	11.82	0.005
Residual Error	12	47681578	3973465		
Total	13	94663483			

Durbin-Watson statistic = 2.15675

Regression Analysis: EXPO versus t (1977-2007)

The regression equation is

EXPO = 29020 + 9751 t

Predictor	Coef	SE Coef	T	P
Constant	29020	9025	3.22	0.003
t	9750.7	492.4	19.80	0.000

S = 24520.0   R-Sq = 93.1%   R-Sq(adj) = 92.9%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	2.35789E+11	2.35789E+11	392.18	0.000
Residual Error	29	17435745769	601232613		
Total	30	2.53225E+11			

Durbin-Watson statistic = 1.499610

Appendix   E

Regression Analysis: IMPO versus t (1960-76)

The regression equation is

IMPO = 36189 + 505 t

Predictor	Coef	SE Coef	T	P
Constant	36189	2525	14.33	0.000
t	505.4	246.4	2.05	0.058

S = 4977.24   R-Sq = 21.9%   R-Sq(adj) = 16.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	104197710	104197710	4.21	0.058
Residual Error	15	371593998	24772933		
Total	16	475791708			

Durbin-Watson statistic = 0.930476

Regression Analysis: IMPO versus t (1977-2007)

The regression equation is

IMPO = 57351 + 12651 t

Predictor	Coef	SE Coef	T	P
Constant	57351	12376	4.63	0.000
t	12651.4	675.1	18.74	0.000

S = 33621.9   R-Sq = 92.4%   R-Sq(adj) = 92.1%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	3.96943E+11	3.96943E+11	351.14	0.000
Residual Error	29	32782509602	1130431366		
Total	30	4.29725E+11			

Durbin-Watson statistic = 0.632861

Appendix   F

Regression Analysis: INTERM versus t (1960-76)

The regression equation is

INTERMD = - 1280 + 1036 t

Predictor	Coef	SE Coef	T	P
Constant	-1280	2163	-0.59	0.563
t	1036.3	211.1	4.91	0.000

S = 4264.72   R-Sq = 61.6%   R-Sq(adj) = 59.1%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	438119239	438119239	24.09	0.000
Residual Error	15	272817620	18187841		
Total	16	710936859			

Durbin-Watson statistic = 0.464653

Regression Analysis: INTERM versus t (1977-2007)

The regression equation is

INTERMD = 16220 + 7842 t

Predictor	Coef	SE Coef	T	P
Constant	16220	6696	2.42	0.022
t	7842.3	365.3	21.47	0.000

S = 18192.8   R-Sq = 94.1%   R-Sq(adj) = 93.9%
Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	1.52523E+11	1.52523E+11	460.82	0.000
Residual Error	29	9598391227	330979008		
Total	30	1.62122E+11			

Durbin-Watson statistic = 0.488868

Appendix   G

Regression Analysis: INVESM versus t (1960-76)

The regression equation is

INVESM = 17597 - 644 t

Predictor	Coef	SE Coef	T	P
Constant	17597	1350	13.03	0.000
t	-644.2	131.8	-4.89	0.000

S = 2661.74   R-Sq = 61.4%   R-Sq(adj) = 58.9%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	169292119	169292119	23.89	0.000
Residual Error	15	106272554	7084837		
Total	16	275564673			

Durbin-Watson statistic = 0.648826

Regression Analysis: INVESM versus t (1977-2007)

The regression equation is

INVESM = 14165 + 2743 t

Predictor	Coef	SE Coef	T	P
Constant	14165	4599	3.08	0.005
t	2742.9	250.9	10.93	0.000

S = 12495.0   R-Sq = 80.5%   R-Sq(adj) = 79.8%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	18658538993	18658538993	119.51	0.000
Residual Error	29	4527641906	156125583		
Total	30	23186180899			

Durbin-Watson statistic = 0.764200

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