External Debt and Economic Growth in Jordan: The Threshold Effect

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Abstract

The Jordanian economy has a serious external debt problem. Based on several indicators, it can be argued that foreign debt has reached an excessive level and has become an impediment to economic growth.

This paper examines the impact of external debt on the performance of the Jordanian economy and determines its optimum level using new econometric techniques that provide appropriate procedures for estimation and inference.

The findings of the study indicate that the optimal level of external indebtedness is about 53 percent of GDP. In other words, when the external debt exceeds this level, its impact on the performance of the Jordanian economy becomes negative.

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I. Introduction:

Jordan occupies an area of about 89,000 square kilometers. With an annual growth rate of about 3 percent, its 4.5 million population is considered to be one of the fastest growing in the world. Furthermore, with an urbanization rate of about 70%, life expectancy of about 70 years and literacy rate of around 85%, Jordan's demographic profile resembles that found in advanced economies. However, with a per capita GDP of around $1550, Jordan is considered one of the poor countries in the world.

It is well - known that Jordan's natural resource base is relatively limited. Other than phosphate and potash, the country does not have any natural resources. Indeed, this is why, traditionally, the economy has relied on external debt, remittances and foreign aid in managing its economic affairs.

Analyzing the economic performance of Jordan is very difficult. The country has passed through many disturbances and these make the detection of any underlying economic trends an extremely difficult task. However, since the end of the 1991 Gulf crisis and its economic impact, the Jordanian economy has been passing through relative stability albeit at a slow rate of economic growth.

The Jordanian economy enjoyed some high growth rates during the period 1973 - 1982. During this period, economic growth stood at an annual average of 11.6% in real terms. This period was characterized by high exports to regional markets, rising worker's remittances and Arab and foreign assistance and loans. Following this period, the slowdown in regional economies and the resultant fall in remittances had

severe repercussions on the economy. Real economic growth during the period 1983 - 1988 decreased to an annual average of about 2.2%. By the end of 1988, the deficit in the general budget was equal to about 25% of GDP and the total external debt was more than 190% of GDP. As a result, the Government devalued the Jordanian Dinar (JD), liberalized the foreign exchange market and embarked on a decade-long austerity and restructuring program supervised by both the International Monetary Fund (IMF) and the World Bank (WB).

The Gulf crisis (1990-1991) and the "temporary" loss of Iraq as the principle market for exports exacerbated Jordan's economic problems. However, and not withstanding these problems, the government has persevered with its economic policies. During the early 1990's, real GDP grew at an average annual rate of about 7% and this was largely due to those who returned from the Gulf (with capital) during and after the crisis. It is well-known that annual remittances accounted for about 25 percent of GDP during the 1990s. Since 1996, however, the pace of economic growth has slowed down and with a real GDP growth rate of about 1.2% in 1997, 2.2% in 1998 and an estimated 1-3% in 1999 and 2000, the economy's performance remains sluggish.

Relative to the current economic stability and somewhat sluggish performance of the economy, there remain a number of important problems and these are unemployment, poverty, and a chronic balance of trade deficit. It is believed that the unemployment rate is currently around 15% of the labour force and poverty is estimated to be around 25% of the population. Moreover, it is well-known that the Jordanian economy has been suffering from a chronic trade deficit problem. In 1999, 2000 and 2001, for

example, the trade deficit was equal to $1.89 billion, $2.71 billion, and $2.55 billion respectively. These values represent an annual mean of about 25% of GDP.

Table 1 reports the size of Jordan's stock of external debt and debt service ratios during the last few years (1997-2001).

Table 1
Jordan's External Debt Stock and Debt Service

Year	1996	1997	1998	1999	2000	2001
Outstanding External Debt ($ Billion)	6.50	7.14	7.62	7.87	7.21	7.10
External Debt as Percent of GDP	99.2	89.2	89.3	89.9	80.0	76
Debt Service Ratio (Cash Basis %)	15.8	14.8	14.4	14.1	15.0	-
Debt Service Ratio (Commitment Basis %)	25.9	24.1	21.9	22.0	20.7	-

Source: Various Central Bank of Jordan Monthly Reports.

The difference between the cash and commitment basis of the debt service ratio implies that the Kingdom could not meet its annual debt payments. Moreover, the decrease in the debt size during the period 2000/2001 was largely due to the debt write-offs provided by the USA. Finally, it is worth noting that a high proportion of Jordan's debt originates from official sources. For example, about 33% and 30% of the external debt was from multilateral institutions (like the IMF and World Bank) and bilateral loans (largely from Japan and Germany) respectively. Similarly, export credit guarantees from countries like Germany, France, Japan, UK and the USA, accounted for about 26% of the outstanding external debt in 2001.

Based on this brief account of Jordan's external debt, one cannot underestimate its importance. The large transfers that could be allocated to investment and consumption are being channeled abroad. Indeed, this may act as a disincentive not only to invest but also to adopt adjustment programs to increase economic growth.

Notwithstanding Jordan's economic problems, successive governments have persevered with some consistent policies and, currently, the country is committed to the followings principles and policies:

- Private sector development
- Export promotion
- Privatization
- Local, Arab and foreign investment promotion
- Utilization of information technology for development

In addition, Jordan has made the decision to liberalize its trade regime and integrate with the world economy by joining the World Trade Organization (WTO) and signing the Association Agreement with the European Union. In other words, Jordan has decided to become an integral part of "economic globalization".

Given Jordan's economic circumstances,, it can be stated that the challenge is to succeed in creating a dynamic economy which is able to compete regionally and internationally, increase real GDP growth by more than the increase in population, reduce dependence on external transfers, reduce poverty and unemployment and

finally, to reduce the external debt overhang. This is why current economic policies are committed to the principle of economic liberalization.

Jordan's privatization process was launched in 1997 as part of the economic reform plan. The privatization law (No. 25 / 2000) was approved by the Lower House of Parliament in May 2000. This law established the Privatization Council to oversee the process through the Executive Privatization Commission and to decide on the use of privatization proceeds through the Privatization Proceeds Fund.

Similar to most privatization programs, the overall objectives of privatization in Jordan include increasing efficiency of state-owned enterprises, expansion of investment by private sector financing, raising revenues to the treasury and signaling the government's commitment to economic reform. The privatization process started in 1998 with the sale of a 33% stake in the Jordan Cement Manufacturing Company to the French-based Lafarge Group. Table 2 reports a summary of the completed privatization deals.

Clearly, the largest privatization achievements were implemented by means of a sale of shares to a "strategic" partner. In other words, the hitherto existing experience shows that the government favours a foreign strategic partner over the sale of shares through the Jordanian (or other) capital market (Amman Securities Market). According to official reports, this method was chosen due to several reasons. First, a strategic partner is more likely to invest in capital projects. Second, a strategic partner would encourage improvements in efficiency and profitability.

Table 2

Summary of Completed Privatization Transactions

Company & Date	Size and Type of Privatization
Public Transportation Company (Sept. 1998)	10-year contract with three local companies ($0.5 million annual fee).
Jordan Cement Company (Dec. 1998)	33% of shares sold to strategic partner; LaFarge of France ($102 million)
Water Authority of Jordan (April 1999)	4-Year performance-based management contract; consortium led by the French company Suez Lyonnaise des Eaux ($2.2 million annual fee)
Royal Jordanian Duty Free Shops (August 2000)	Sold to the Spanish airport retail group; Aldeasa ($60.1 million)
Telecommunications Company (January 2000)	Sold 40% stake to a consortium led by FranceTelecom and Arab Bank ($508 million) and to Jordan Social Security Corporation ($114 million).

The literature about the relationship between external debt and growth or the effect of debt on growth can be summarized by three strands of thought: The first sees external debt as a capital inflow with a positive effect on domestic savings and investment and thus on growth. This argument implies that foreign savings complement domestic savings and investments (Eaton, 1993). The second strand considers external debt as a substitute to domestic savings and investment and therefore tends to crowd them out (Krugman, 1988; Alesina and Tabellini, 1989; and Tornell and Velasco, 1992). The argument here runs as follows. If future debt is going to be greater than a country's ability to repay its loans, the expected debt service will be an increasing function of its output level. In other words, the returns from investing in a country are seen as being subjected to a high marginal tax by creditors and this might discourage domestic and foreign investors. These models or theories are known as the debt overhang theories. Finally, more recent studies have attempted to reconcile the above conflicting views by developing models with non-linear effects of debt on growth. For example, Cohen and Sachs (1986) and Cohen (1991, 1992) present endogenous

growth models where capital accumulation is the sole force driving growth. Countries' access to international financial markets is limited because of the risk of debt repudiation. Growth is high in the early stages as the country borrows and invests. Later on, growth falls to a lower level, and this new level would be higher than it would have been had there been no international borrowing and lending (financial autarky). The stage of repaying countries' debts does not crowd out investment because lenders are more patient and value growth more than the debtor countries themselves. This result, however, depends on the ability of lenders to implement optimal rescheduling policies. If they are not able to commit themselves to this policy, a debt overhang scenario will occur and investment and growth in the later stages will be even lower than in financial autarky.

Another relevant theoretical model is developed by Calvo (1998). This model links the debt and growth problem to capital flight. In his model, Calvo shows that high debt levels are associated with low growth since a higher distortionary tax burden on capital is required to service debt, leading to a lower rate of return on capital, and lower investment and growth. Low debt regimes have high growth rates for the opposite reasons. Thus, the empirical implication of these models is a non-linear effect (threshold effect) of debt on economic growth. In other words, these models suggest that the effect of debt could become negative when external indebtedness becomes excessive. It is necessary, therefore, when examining the relationship between debt and growth, to take into account the existence (if any) of the threshold effect. In other words, it is useful to determine at what level the effect of external indebtedness on economic growth becomes negative.

While there have been several attempts to empirically assess the external-economic growth link (see among others, Borensztein, 1990; Iyoha, 1996; Mbire and Atingi, 1997; Fosu, 1999; and Were, 2001), few studies consider the possibility of the existence of non-linear growth effects of external debt. Elbadawi et al. (1997) and Pattillo et al. (2001) are the only researchers that directly considered the non-linear effects of debt on growth. They present fixed and random effects panel estimation of a growth regression in which external debt enters both in a linear and quadratic form. They report growth maximizing debt to GDP ratios equal to 97 percent and 70 percent respectively.

Given the fact that the Jordanian economy faces some serious challenges including its "large" external debt, it is felt important and timely to investigate the following question: At what level (if any) does the external debt level start to have a negative impact on the performance of the Jordanian economy? In other words, what is the "optimal" level of debt in the Jordanian economy?

Since we believe that this issue (threshold effect) is very much country-specific, the results of the above-mentioned studies need to be interpreted carefully and may not be easily extrapolated to general statements. In other words, there is a need for case-by-case studies that take into consideration each country's unique characteristics. Furthermore, our paper differs from the above attempts in that we use new econometric methods for the threshold estimation. These methods have recently been developed by Hansen (1996, 1997; 1999 and 2000a,b) and Caner and Hansen (2000).

The rest of the paper is organized as follows. In Sections II and III, we discuss the methodology and the statistical properties of the data respectively. The empirical results are presented and discussed in Section IV. Finally, Section V summarizes and concludes the papers.

II. Empirical Methodology

Following the endogenous growth models (known as the AK models) developed by Romer (1986), Lucas (1988) and Pagano (1993), we use the following specification to examine the relationship between external debt and economic growth after taking into account the possibility of the existence of a threshold effect:

$$y_t = \alpha_0 + \alpha_1 INV_t + \alpha_2 GWAP_t + \alpha_3 \pi_t + \alpha_4 d^{\pi^*}[\pi_t - \pi^*] + \theta' X_t + \varepsilon_t \qquad (1)$$

$$d_t = \begin{cases} 1 & if\ \pi_t > \pi^* \\ 0 & if\ \pi_t \le \pi^* \end{cases} \qquad t = 1,\ldots T;$$

where y_t is the growth rate of real GDP, measured by the first difference in the logarithm of the real GDP series, INV is gross capital formation as a proportion of GDP (the effect of physical capital accumulation), GWAP is the growth rate of working age population (the effect of human capital accumulation), π is the share of external debt to GDP, π^* is the threshold level of external debt, and d^{π^*} is a dummy variable that takes the value of one to external debt level greater than π^* percent and zero otherwise. X_t is a vector of control variables and these include terms of trade (TRAD), inflation rate (INF), measured by the first difference in the logarithmic of the CPI series, and government expenditure (current) as a share of GDP (GEX). ε_t is

the error term, which represents measurement errors in the independent variables, and any other explanatory variables that have been omitted. This term is assumed to be independently and identical normally distributed with zero mean and constant variance, $\varepsilon_t \approx iidN(0, \sigma_\varepsilon^2))$. The subtraction of π^* from π makes the relationship between growth and external debt, described by equation (1), continuous at the threshold level π^*[1].

In the above model, the effect of external debt on GDP growth is given by α_3 when external debt is less than or equal to the optimal external debt level (π^*), and by $\alpha_3 + \alpha_4$ when external indebtness is higher than the optimal one.

Note that X_t contains a number of variables among a large set found in the empirical growth literature because very few of these variables pass the robustness tests in Barro (1991), Mankiw et al. (1992) Levine and Renelt (1992), Barro and Sala-I-Martin (1995) and Sala-I-Martin (1997). In this paper, we include the inflation rate and the ratio government expenditure to GDP as indicators of macroeconomic stability, and terms of trade to capture the degree of openness of the economy.

Staking the observation in vectors yields the following compact notion for equation (1):

$$y_t = X\beta_\pi + e \qquad \pi = \underline{\pi},...,\overline{\pi} \qquad (2)$$

[1]Continuity of the relationship given by equation (1) is desirable, otherwise small changes in the external debt level around the threshold level will yield different impacts on growth depending on whether external debt is increasing or decreasing.

where $\beta_\pi = (\alpha_0\, \alpha_1\, \alpha_2\, \alpha_3\, \alpha_4\, \theta')'$ is the vector of parameters and X is the corresponding matrix of observations on the explanatory variables. The coefficient vector β is indexed by π to show its dependence on the threshold level of external debt, the sign of which is given by $\underline{\pi}$ and $\overline{\pi}$. Given that $s_1(\pi)$ is the residual sum squared with threshold level of external debt at π estimated using least-squares, the optimal threshold level of external debt is chosen that minimize $s_1(\pi)$

$$\pi^* = \arg\min\left\{S_1(\pi),\ \underline{\pi},...,\overline{\pi}\right\} \qquad (3)$$

It is important to determine whether the threshold effect is statistically significant. The hypothesis of no threshold effect in equation (1) can be represented by the following null hypothesis: $(H_0 : \alpha_4 = 0)$. Under H_0 the optimal external debt (π^*) is not identified, so classical tests have non-standard distributions. Hansen (1996, 1997, 1999, and 2000a,b) suggested a bootstrap method to simulate the asymptotic distribution to test H_0 using the likelihood ratio

$$LR\ (\pi) = \frac{S_0 - S_1(\pi)}{\sigma^2(\pi)} \qquad (4)$$

where S_0 and $s_1(\pi)$ are the residual sum of squares under $H_0 : \alpha_4 = 0$ and $H_1 : \alpha_4 \neq 0$, respectively; and $\sigma^2(\pi)$ is the residual variance under H_1. In other words, S_0 and $s_1(\pi)$ are the sum square errors from estimated equation (1), using the Ordinary Least Square Method (OLS), with and without threshold effects, respectively. The

asymptotic distribution of LR is non-standard, and strictly dominates the χ^2_k distribution. Hansen (1996, 1999, and 2000a,b) argues that because the distribution of LR_1 depends on the moments of the sample, the critical values cannot be tabulated. He shows that a bootstrap procedure attains the first-order asymptotic distribution, so the *p*-value constructed from the bootstrap is asymptotically valid[2].

Prior to applying the estimation procedure mentioned above, it is important to consider whether the variables under consideration are stationary. We test for stationarity to ensure that the variables used in the regressions are not subject to spurious correlation. The Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) units root tests are used to investigate the stationary status of each variable under consideration.

III. Data Description

The annual (1970-2000) data source for all the variables under consideration is compiled from various issues of the "Monthly Statistical Bulletin" published by the Central Bank of Jordan. Table 3 provides summary statistics for the variables.

As can be seen, all variables, except for the growth of working age population, do not significantly depart from the normal distribution (values of skewness and kurtosis are 0 and 3 respectively, if the observed distribution is normal). The Jarque-Bera test statistics for normality are also low and insignificant (either at the 1% level or at the 5% level) for all variables, except for the growth of working age population. This

[2] See Hansen (1996) for more details about how to bootstrap the distribution of LR .

suggests that the null hypothesis of these variables conforming to a normal distribution cannot be rejected. The growth of working age population shows significantly high values of kurtosis (8.88) indicating that for a given level of standard deviation, observations of this variable cluster around a central point with a small number of large outliers. The Jarque-Bera test statistic is highly significant suggesting that growth of working age population departs significantly from the normal distribution.

Table 3
Summary Statistics

y_t is the growth rate of real GDP measured by the first difference in the logarithm of the real GDP series. INV is gross capital formation as a proportion of GDP, GWAP is growth of working age population, π is the share of external debt to GDP, TRAD is terms of trade, INF is inflation rates (INF) measured by the first difference in the logarithmic of the CPI series, and GEX is government expenditure (current) as a proportion of GDP. ADF is the Augmented Dickey-Fuller test. PP is the Phillips-Perron test. The null hypothesis tested that the relevant series contains a unit root against the alternative that it does not. *, **, and *** are significant at the 1%, 5%, and 10%, respectively

	y	GWAP	INV	π	INF	TRAD	GEX
Mean	0.042	0.036	0.262	0.571	0.073	0.842	0.267
Median	0.033	0.031	0.263	0.279	0.064	0.843	0.265
Maximum	0.211	0.131	0.471	1.684	0.229	1.090	0.325
Minimum	0.167	-0.026	0.119	0.197	0.001	0.640	0.222
Std. Dev.	0.081	0.026	0.078	0.499	0.054	0.105	0.025
Skewness	0.007	1.806	0.421	0.215	0.973	0.206	0.508
Kurtosis	3.349	8.882	3.268	2.931	3.684	2.576	3.195
Jarque-Bera	0.148	57.573*	0.976	0.406**	5.138***	0.437	1.339
ADF in level	2.304	-2.139	2.636	-1.315	1.677	2.295	1.686
PP in level	2.609	2.707**	2.268	-1.497	2.671	4.595*	2.264
ADF in 1th difference	4.160*	2.9983**	3.232**	2.960***	3.028**	2.895***	4.128*
PP in 1th difference	6.786*	4.0181*	3.619**	-5.228*	5.412*	8.652*	6.507*

As mentioned above, prior to applying the estimation procedure, it is important to consider whether the variables of interest are stationary. For this purpose, we perform a unit root test using both the ADF and PP tests. These tests are applied to the level

variables as well as to their first differences. The second half of Table 3 provides the results of the unit root test of each variable of interest. The reported results indicate the presence of a unit root (levels) in all variables. In other words, the null hypothesis that each of the time series has a unit root cannot be rejected at the 5% level in both tests. However, there is no evidence from either test that supports a unit root in the first difference of all the variables. These results are broadly consistent with the hypothesis that the variables under investigation are individually integrated of the order one I(1). Therefore, it is necessary, before we perform the test procedure, to transfer the variables of interest by taking their first difference operator to achieve stationarity[3]. However, one may argue that differencing the variables leads to some loss in their long-run properties. To test for the long-run relationship between economic growth and its determinants, we use the Engle-Granger two-step co-integration test. We generate the residuals series from the long-run equation of the non-stationary variables, and then we test for the existence of a unit root in this series using both the ADF and PP tests. If the null hypothesis that the residual series has a unit root is rejected, we can conclude the there is a stable long-run relationship that ties together with the evolution of real GDP growth and the evolution of its determinants.

As a first step in exploring the bivariate relationship between growth and debt, Figure 1 plots the evolution of growth and debt over time. The figure shows that the debt ratio has peaked in the late 1980s. Growth appears to be positively correlated with debt when debt levels are relatively low and this relationship becomes negative at

[3] Another advantage of running regressions using first differences of the data is to reduce any influence of multicollinearity, thus improving the robustness of the estimation results.

higher levels. These observations provide some pre-evidence that there is a non-linear relationship between external debt and growth. Thus, it is possible, in principle, to estimate the inflexion point, or threshold, at which time the sign of this relationship changes.

Figure 1. Growth and External Debt Over Time

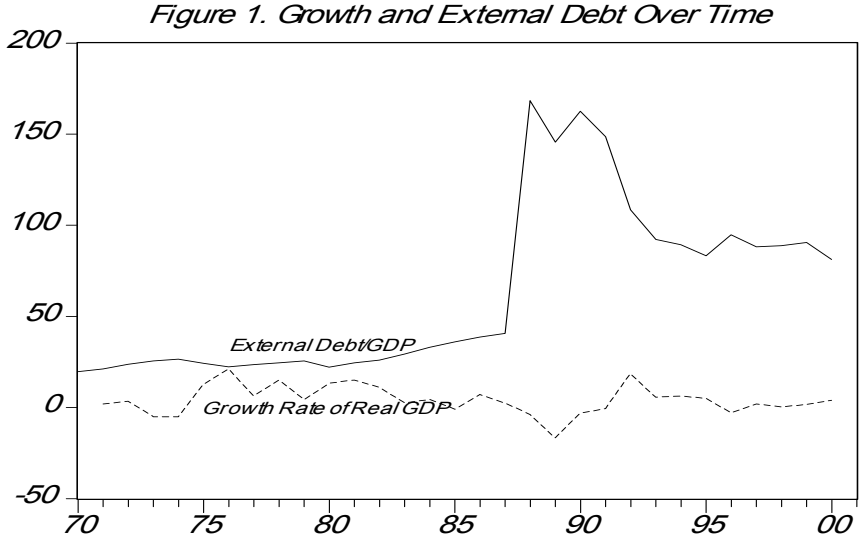

Table 4 presents the correlation matrix among the variables. The first number is the correlation coefficient and the second is the P-value (a value of less than 0.05 indicates that the correlation is significant at the 5% level). As can be seen, the ratio of external debt to GDP is negatively and statistically correlated with growth. However, finding a negative correlation between external debt and growth suggests, but clearly does not prove that low levels of external debt imply higher growth. Part of the correlation may be spurious, reflecting the effect of other factors (traditional growth determinants) and the non-linearity of the debt-growth relationship posited by theory. In the next section, we examine the non-linearity (threshold effects) in the debt-growth relationship using the multivariate regression analysis described above.

Table 4
Estimated Correlation Matrix of Variables

	y	GWAP	INV	π	INF	TRAD	GEX
y	1.00000	-0.33921	0.47559	-0.45209	-0.33693	0.10947	0.15355
GWAP	-0.33921	1.00000	0.20108	0.18711	0.01549	0.01982	-0.34433
INV	0.47559	-0.20108	1.00000	-0.03845	0.02572	0.10766	0.182610
π	-0.45209	0.18711	-0.0384	1.00000	0.11194	0.39764	-0.29370
INF	-0.33693	0.01549	0.02572	0.11194	1.00000	0.12928	0.58643
TRAD	-0.10946	0.01980	0.10766	0.39764	0.12928	1.00000	0.03849
GEX	0.15355	-0.34433	0.18261	-0.29370	0.58644	0.03849	1.0000

Note: For the definition of the variables see Table 3.

A. Test for the Unknown Threshold Effect

The first step in the analysis is to test for the existence of a threshold effect in the relationship between real GDP growth and external debt using the likelihood ratio, LR , discussed above. This is established by estimating equation (1) in the first difference and computing the residual sum of squares (RSS) for the threshold levels of external debt levels ranging from $\underline{\pi}$ to $\bar{\pi}$. The optimal threshold level (external debt level) is the one that minimizes the sequences of RSSs. Table 5 summarizes the test results.

The first column provides the range over which the search for the optimal external debt level is conducted. The range lies between $\underline{\pi}$=30 and $\bar{\pi}$=100 with increments of 1 percent. This procedure yields 70 regressions of equation (1). As can be seen from the second column of Table 5, the smallest residual sum squared is found by setting the optimal external debt level at the 53 percent level. The third column in Table (4)

reports the estimated value of the likelihood ratio (LR). The significant levels have been computed using the bootstrap distribution of LR . The null hypothesis of no threshold effect can be rejected at least at the 1% significant level. Thus the data strongly supports the existence of a threshold effect at 53 percent of external debt to GDP.

Table 5

Tests for Threshold Effects (Optimal Debt Level)

Search Range for Thresholds	Optimal Threshold	*LR*	Critical Value (1%)	Sig. Level (*P*-Value)
{30 ,31 ,32 ,..., 100	53	16.853	11.35	0.0000

B. Estimation Results

The first column in Table 6 provides the estimation results of the first difference of equation (1) conditional on the threshold estimate of the previous sub-section (at the threshold estimate of 53%), using the OLS method.

The individual coefficients of the regression enter with the appropriate signs. The proxy for human capital stock and growth in working age population enter positively but not statistically significant at the 10% level[4]. This could be explained by referring to the fact that Jordan suffers from high levels of unemployment (especially structural).

[4] This result is consistent with other growth studies that found no or very limited effects of human capital on growth (see for example, Barro and Sala I-Martin (1995)).

Table 6
Estimation Results

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta INV_t + \alpha_2 \Delta GWAP_t + \alpha_3 \Delta \pi_t + \alpha_4 d^{\pi^*} \Delta[\pi_t - \pi^*] + \theta' \Delta X_t + \Delta \varepsilon_t$$

$$d_t = \begin{cases} 1 & if\ \pi_t > \pi^* \\ 0 & if\ \pi_t \le \pi^* \end{cases} \qquad t = 1,....T;$$

	OLS	2SLS
Constant	-0.6827***	-0.7869***
	(-1.883)	(-1.7840
INV	0.3699**	0.2397**
	(2.0464)	(2.2491)
GWAP	0.0628	0.0453
	(1.075)	(0.983)
π	0.1555**	0.1288**
	(2.0475)	(2.18400
D*(π - π *)	-0.6537**	-0.6926**
	(-2.429)	(-2.362)
INF	-1.1058*	-0.7256*
	(-3.487)	(-3.827)
TRAD	0.3137**	0.4963**
	(2.117)	(2.254)
GEX	-0.4216	-0.2331
	(-0.718)	(-0.4212)
R^2	0.7135	0.832
F-statistic	6.0509*	7.516*
D.W	2.0405	1.9998
$\chi^2 sc(1)$	0.4867	2.8651
$\chi^2 ff(1)$	0.0272	-
$\chi^2 n(2)$	4.2855	3.0905
$\chi^2 h(1)$	1.0653	2.6849
ARCH(6)	0.0969	0.1326
ADF	-3.6957**	-3.4681**
PP	-5.0159*	6.4130*

D.W. is the Durbin-Watson test for residual serial correlation. The F-test tests the null hypothesis that all coefficients except for the intercept are zero. The reported misspecification tests are conducted to test a number of null hypotheses on the residuals. These tests are $\chi^2 sc(1)$, $\chi^2 ff(1)$, $\chi^2 n(2)$, $\chi^2 h(1)$, ARCH which are defined respectively as follows: $\chi^2 sc(1)$ = Serial correlation; Lagrange multiplier test of residuals serial correlation. $\chi^2 ff(1)$ is the functional form; Ramsey's REST test using square fitted values. $\chi^2 n(2)$ =Normality, based on a test of skewness and kurtosis of residual. $\chi^2 h(1)$ is heteroscedasticity, based on the regression of squared residual on squared fitted values. ARCH is the autoregressive conditional heteroscedasticity test. Finally, ADF and PP are residual-based Augmented Dickey-Fuller test and the Phillips-Perron test of cointegration. Heteroscedasticity-consistent t-statistics in parentheses. *, **, and *** are significant at the 1%, 5%, and 10%, respectively For the definition of the variables see Table 3.

The importance of investment (proxied by gross capital formation adjusted by GDP) is emphasized by the strongly positive and statistically significant relationship that it exhibits with economic growth[5]. A one-percentage point increase in investment to GDP is associated with a 0.37 percentage point increase in real GDP growth rate. This result is consistent with the theoretical view and empirical findings. Economic theory holds that higher rates of savings and investments are important determinants of the long-run growth rate. The suggestion behind Solow's (1956) framework is that higher investments and savings rates lead to more accumulated capital per worker and this results in an increase in economic growth, but at decreasing rate. Under endogenous growth theories that emphasize the broader concepts of capital (Rebelo, 1991), economic growth and investment tend to move together.

Government expenditure (current) as a percentage of GDP enters negatively but not statistically significant at the 10% level. The explanation of this result can be found in the supply side theories since the Jordanian budget revenue is based mainly on taxes (direct and indirect)[6]. These theories argue that taxes required to finance government expenditure distort incentives and reduce the efficient allocation of resources and the level of output[7]. The effect of openness, as measured by terms of trade, is positively and statistically significantly correlated with economic growth. Trade openness is posited to boost productivity through the transfer of knowledge and efficiency gains (Coe and Helpman, 1995; and Ben-David and Kimhi, 2000).

[5] This result is consistent with the findings of Sinha and Tapen (1999). They studied the effect of growth of openness and investment on the growth of GDP in 15 countries including Jordan. They found the coefficient of the growth of domestic investment in Jordan is highly positive and significantly different from zero at the 1% level.

[6] Total taxes revenue (direct and indirect) in Jordan accounted for 56.5 % of current expenditures in 2000.

[7] See Leibfritz et al. (1997) for a comprehensive survey on the link between taxation and economic performance.

The effect of inflation rate enters strongly negative and statistically significant at the 1% level. This result is consistent with a number of theoretical and empirical views[8]. High inflation rates can lead to uncertainty about future inflationary pressures. To function efficiently, economic agents require clear signals from markets when making decisions regarding consumption and investment because these decisions are largely dependent on the formulation of expenditures regarding prices. However, inflation uncertainty causes the real value of future payments and earnings to be uncertain, and thereby can distort economic agents' decisions regarding investment and consumption. Inflation can also discourage[9] long-term lending by financial intermediaries and this tends to reduce investment rates.

The most important result in this regression analysis is the effect of external debt. As can be seen, there is a positive and statistically significant relationship between growth and external debt below the threshold level (optimal external debt) and a significant and more powerfully negative impact of external debt rates above the 53% threshold level. In other words, our results show that the positive effect of external debt on growth rapidly changes sign as external debt levels increase above the optimal level. For example, an increase in the external debt from 50% to 100% of GDP reduces the growth rate by 7.4 percentage points.

The specification tests are satisfactory. As can be seen, the regression explains about 71 % of the variation in the economic growth of Jordan. The F-statistic (F=6.05)

[8] See for example, Temple (1999) and Khan and Senhadji (2000) for empirical evidence and Dotsey and Sarte (2000) for theoretical explanations.
[9] In fact, a high inflation rate encourages speculative, less-productive or non-productive investments in land and real estate, and discourages long-term and illiquid investment projects, thereby has a negative effect on economic growth.

rejects the null hypothesis of no explanatory power for the regression as a whole at the 1% level. The test of residuals shows some interesting information. The Lagrange Multiplier test of the residual serial correlation accepts the null hypothesis of no autocorrelation. In addition, there appears to be no significant autoregressive conditional heteroscedasticity ARCH using 6 lags. Moreover, the heteroscedasticity test (White test), that involves an auxiliary regression of the squared errors and the original regressors and their squares, could not reject the null of homoscedasticity. The statistical test of the skewness and kurtosis of the residuals corresponds to that of a normal distribution. The Ramsey RESET test also could not rejected the null of correct specification of the model at the 5% level. This provides clear evidence that the estimated model is appropriate. Finally, both the ADF and PP tests reject the null hypothesis that the residual series has a unit root. Thus, we can conclude that there is a stable long-run relationship that ties together the evolution of the growth rate in real GDP with its determinants.

Relative to the above, it must be stated that external debt may not be an exogenous variable in the growth-debt regression. In other words, the estimated coefficients may be biased. Similarly, investment and other control variables are also likely to be endogenous to growth. To control for this problem (simultaneous bias), the model is also estimated using the Two-Stage Least Squares method (2SLS), where all explanatory variables are treated as potentially endogenous to growth. The results are presented in the third column of Table 6. Consistent with the above results, the 2SLS yields a threshold estimate of around 55% and a positive and statistically significant relationship between growth and external debt below this threshold level. Moreover, a

significant and more powerful negative impact of external debt on economic growth is found when the Jordanian external debt level exceeds the 55% threshold.

V. A Summary and Conclusions

The central focus of this paper was to examine the impact of Jordan's external indebtedness on its economic performance. This issue is important given the fact that the Kingdom's external debt stood at $7.21 billion in 2000. This figure represents about 80% of GDP.

Following a brief review of the Jordanian economy's performance, its challenges and the extent of international indebtedness, a number of conclusions are highlighted. First, a one-percentage point increase in investment to GDP is associated with a 0.37 percentage point increase in real GDP growth rate. This result is consistent with the theoretical arguments and international empirical findings. Second, the effect of openness, as measured by terms of trade, is positively and statistically significantly correlated with economic growth. Again, this result is expected and depends on the argument that trade openness tends to boost productivity through the transfer of knowledge and efficiency gains. Third, the impact of inflation on the performance of the economy is negative. This result is consistent with a number of theoretical views and empirical findings. High inflation rates can lead to uncertainty about future inflationary pressures. Indeed, for a given economy, to function efficiently, economic agents require clear signals from markets when making decisions regarding consumption and investment because these decisions are largely dependent on the formulation of expenditures regarding prices. However, inflation uncertainty causes

the real value of future payments and earnings to be uncertain, and thereby can distort economic agents' decisions regarding investment and consumption.

The most important result in this paper is the effect of external debt. The empirical results indicate the existence of a positive relationship between economic growth and external debt below a certain threshold level (optimal external debt). This level is found to be equal to about 53 percent of GDP. In other words, once the external debt exceeds this level, its impact on the performance of the Jordanian economy (growth) becomes negative and statistically significant. It is estimated, for example, that an increase in the external debt from 50% to 100% of GDP reduces the growth rate in GDP by about 7.4 percentage points. Based on this empirical finding, one cannot and should not underestimate Jordan's external debt "crisis".

Based on the brief overview of the Jordanian economy, it was stated that the challenge for Jordan is to succeed in creating a dynamic economy which is able to compete regionally and internationally, increase real GDP growth by more than the increase in population, reduce dependence on external transfers, reduce poverty and unemployment and finally, to reduce the external debt overhang. This is why successive governments have persevered with some consistent policies and, currently, the country is committed to economic liberalization, private sector development, export promotion, privatization, local, Arab and foreign investment promotion, and the utilization of information technology for development. All of these policies an others like public expenditure cuts are meant to improve the performance of the economy and to increase exports that will enable the country to payback its external debts.

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