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DOES INFLATION HARM ECONOMIC GROWTH IN JORDAN? AN ECONOMETRIC ANALYSIS FOR THE PERIOD 1970-2000

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Abstract

It is expected that inflation we will be an important issue in Jordan because the central bank of Jordan is adopting an easy monetary policy to help promoting the financial market. Therefore, this paper explores the relation between inflation and economic growth to check whether if this relation has a structural breakpoint effect or not.This paper shows that the structural breakpoint effect occurs at inflation rate equal to 2% and after this level the effect turns to be negative. This result says that the maneuver of the monetary policy will be very limited. And, the central bank of Jordan should pay attention to the inflation phenomenon while conducting the new monetary policy.

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1. Introduction

Inflation can be defined as a permanent increase in the aggregate price level which implies a diminishing of the purchasing power[1] and increase the cost of living. It is important to note from this definition that the movement in the price level needs to be permanent to believe it as inflation. Inflation considered one of the economic phenomena that still polarized attention of both development and developing countries. Also, it is considered a complex economic subject because it represents a tangible phenomenon and not only a macroeconomic

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[1] Diminishing of the purchasing power (DOPP) can be measured by the reciprocal of the increase in the cost of living, DOPP= (Pt-1/Pt)*100.

variable such as gross domestic product and investment. In addition, there are many different reasons that may cause inflation. Therefore, the economic school of thoughts and many economists tried to study this observable variable in order to analyze, explain and understand its relation with the other macroeconomic variables. The importance of inflation, as a macroeconomic variable, in the literature comes from its ability to reflect the economic stability of a nation, or the ability of the government to control the economy through its monetary and fiscal policies. Moreover, inflation may give an idea about the trade policy of a nation such as the degree of openness.

In the mid of the last century, the literature about inflation showed that the economists spent much time to understand the reasons that causes inflation. The economists succeed to give details about the sources of inflation. But, until now the relation of inflation with the other macroeconomic variables such as the economic growth still debatable and there is still a disagreement about a lot of issues. Mankiw (2000) addressed the relation of inflation with the other macroeconomic variables as one of the most important unresolved questions of the macroeconomics. Specifically, Mankiw (2000) mentioned that both the cost of inflation and the cost of reducing inflation are topics on which the economists often disagree.

The macroeconomic literature shows that the possibility to have either a positive or negative relation between inflation rate and economic growth exists. Sarel (1995) point out an important issue which is; the empirical studies before 1970, a period described by low inflation, find a positive or non-significant relation between inflation and economic growth. But, after 1970 the inflation started to be high and severe. For this reason many studies such as: Kormendi and Meguire (1985), De Gregorio (1991), Fischer (1993), Motely (1994), Barro (1995), Andres and Hernando (1997) find a negative relation between inflation and economic growth.

But, the recent studies started to focus on a new methodology to detect the relation more carefully through looking to a nonlinear or a structural break effect. Generally, this new methodology says that the

effect of inflation could be positive until a certain level and after this level the effect turns to be negative. Several studies have different results but all of them confirm the structural break effect. Sarel (1995) find a negative structural break effect occurs when inflation rate is 8%. Barro (1996) illustrates a negative relation above 15%. Bruno and Easterly (1996) stated a structural break negative effect above 40%. Judson and Orphanides (1996) proved a negative threshold affect at 10%. Ghosh and Phillips (1998) find a positive impact of low inflation, but above 5% it turns to be non-linear and negative.

Moreover, the economists started to concentrate on a new concept mentioned early by both Okun (1971) and Freidman (1977) which is inflation uncertainty that means unpredictability of future inflation. The abovementioned economists agreed that higher inflation leads to greater inflation uncertainty. This new concept motivated many economists to study empirically the relation between inflation and inflation uncertainty and this required to find a proxy to this concept. Crawford and Kasumovich (1996), Barro (1996), Joyce (1997) and Ma (1998) confirmed that the level of inflation and inflation uncertainty are positively correlated. In addition, this new finding opens a new dimension for the relation between inflation and the economic growth.

The empirical studies in this part have different results; Barro (1996) finds that inflation variability, which is measured by standard deviation of inflation rate around its decade mean, has an insignificant effect on economic growth. Judson and Orphanides (1996) discover a negative relation.

They measure the inflation variability by the standard deviation. Also, Ma (1998) confirmed a negative relation between inflation and economic growth. But, he is not sure about the relation between inflation uncertainty and economic growth in Colombia. Ma (1998) measured the inflation uncertainty by using the ARCH model. Also, Neypati (2000) and Berument, Metin-Ozcan and Neyapti (2001) used the ARCH model to measure the inflation volatility in Turkey.

Empirically, the economists employed both time series data from one country and cross sectional from several countries to examine the relation between inflation, inflation uncertainty and economic growth. Despite that these efforts are big but still there is a disagreement in the results. In this paper, I will use data from the Jordanian economy, and I believe that by doing this step I can hit two points at the same time; first, I can contribute empirically to the literature by adding evidences to support this point of view or these. Second, I believe inflation is an important issue to the Jordanian economy especially with the latest internal and external developments. In addition, there is a lack of such studies in Jordan.

Maghyereh (2003) finds that the effect of the inflation rate on the economic growth is strongly negative and statistically significant. The current study tries to check whether this effect may be positive for a specific level of inflation rate. In addition, it seeks to assess the result of inflation uncertainty on economic growth.

The current paper will use a yearly data over the period 1970-2000 to study the relation between inflation and economic growth. And, it will estimate a proxy for the inflation uncertainty by using a monthly data over the period 1976:01-2003:10. All the series were obtained from the from IMF publication International Financial Statistics (CD-ROM, February-2004). The rest of the paper is organized as follows: section 2 presents information about the Jordanian economy and inflation. Section 3 discusses the methodology of this study. Section 4 presents the empirical results of this study. Finally, Section 5 provides summary and conclusions.

2. Inflation in Jordan

Jordan is a lower middle income country with about 5.3 million inhabitants and annual per capita income at current prices of JD 1248. The inflation phenomenon in the Jordanian economy is enforced by three main reasons; the monetary and fiscal policies, the high openness rate toward the regional and international economics and the weak of structural productive base for the Jordanian

economy. The last two reasons make the inflation is a sensitive and serious problem and hard to control or put high burden on the government. Looking historically to the inflation rate measured by the percentage change in the annual consumer price index (CPI) in Jordan during the period (1970-2003) shows clearly that this rate fluctuates. The average inflation rate during this period is around 7.0% and this rate considered high if we take into consideration that the average annual inflation rate in Jordan is not indexed to the annual increase of the wages and salaries. Table 1 gives an idea about the fluctuation of the inflation rate during sub periods.

Table 1: Inflation Rate in Jordan for Sub Periods During 1970-2003

Period	Inflation Rate
1970-1972	6.1
1973-1982	11.6
1983-1987	2.3
1988-1991	14.2
1992-1998	3.7
1999-2003*	1.4

* For the first nine months.

In 1988/1989 the Jordanian economy experienced bad economic shock leads to high inflation rate reached to 25.7% and negative economic growth get in touch with -16.7%. At that time, Jordan adopted an economic adjustment program aimed to achieve economic stability. At the mid of 1990s, the Central Bank of Jordan (CBJ) adopted a tight monetary policy (high interest rate) to control the aggregate demand. But, It was expected, couple of years ago, that the CBJ cannot keep working with the high interest rate policy on the certificate of deposits (CD,s) because of three reasons; the high cost paid by the CBJ on using the CD's to control the aggregate demand.

Table 2 gives an idea about this cost. Also, it is clear from Table 2 that the interest rate of the CD's for both 3 Months and 6 Months declined drastically during the period (1999-2002). Second, moving toward developing the financial market (Amman Stock Exchange) requires the CBJ to lower the interest rate on its debt instruments.

Third, the structure of the interest rate in Jordan should be consistent with the structure of the interest rate in the international financial markets, especially the interest rate on the U.S. dollar. Therefore, I believe inflation will be an important issue during the coming period because the CBJ need to work between two edges; guarantee developing the financial market and prevent high inflation rate. Therefore, it is important from a policy application point of view to determine the exact relation between inflation and economic growth and to check whether if there is a structural break in this relation or not.

Table 2: The Outstanding Balance of the Certificate Deposits Issued by the CBJ During the Period 1994-2002

Year	CDs for 3 months Mill. JD	CDs for 6 months Mill, JD	Interest rate for 3 months %	Interest rate for 6 months %	Cost of CDs for 3 months Mill. JD	Cost of CDs for 6 months Mill. JD	Total Cost Mill. JD	Ratio to GDP %
1994	109.2	170.9	7.75	7.94	8.5	13.6	22.1	0.5
1995	136.7	183.3	8.75	9.00	12.0	16.5	28.5	0.6
1996	172.6	444.9	9.25	9.50	16.0	42.3	58.3	1.2
1997	312.6	573.0	6.25	6.50	19.5	37.3	56.8	1.1
1998	344.7	526.8	9.45	9.55	32.6	50.3	82.9	1.5
1999	950.0	70.0	6.00	8.25	57.0	5.8	62.8	1.1
2000	619.0	723.0	6.00	6.06	37.1	43.8	80.9	1.4
2001	916.5	317.0	3.90	4.00	35.7	12.7	48.4	0.8
2002	1073.5	570.0	3.00	3.45	32.2	19.7	51.9	0.8

Source: CBJ, the annual report (2003) and the monthly statistical bulletin. Data in million JD.

3. The Methodology

This study will use two methodologies to achieve its goals; the first one will utilize the Autoregressive Conditional Heteroskedasticity (ARCH) model to estimate a proxy to the inflation variability. The second one employs a multiple regression model consistent with the Jordanian economy that able to confirm stylized facts about the

determinants of economic growth as documented by many other studies such as: Kormendi and Meguire (1985), Barro (1991), De Gregori (1991), Sarel (1995) and Kirmanoglu (2000).

3.1 Autoregressive Conditional Heteroskedasticity (ARCH) model

Early studies on inflation uncertainty used the observed variance or standard deviation of inflation as a measure of uncertainty. The problem with using such measures is that it could well have been forecast by the economic agents (Joyce 1997). Therefore, the economists started to estimate a forecasting equation for inflation, and then from which a conditional variance of forecast errors is calculated and employed as a measure for inflation variability. The ARCH models were introduced by Engle (1982).

This methodology started by estimating a regression model subject to the assumption that the variance of the stochastic errors vary over time (heteroskedastic) and relies on the square of the stochastic term at time (t-1). Thus the model can be written as follows assuming we have a dependent variable is described by a first-order autoregression:

$$Y_t = a_o + a_1 Y_{t-1} + U_t \qquad (1)$$

$$U_t \sim N(0, V_t) \qquad (2)$$

$$V_t = ß_0 + ß_1 U^2_{t-1} \qquad (3)$$

Where Y_t is the level of the dependent variable being modeled. V_t is the conditional variance for the dependent variable. U_t is the stochastic error, and a_o, a_1, $ß_0$, $ß_1$ are the estimated parameters. An extension suggested by Bollerslev (1986) by including the lagged values of the conditional variance in equation (3) and this for called generalized ARCH (GARCH). Thus equation (3) becomes:

$$V_t = ß_0 + ß_1 U^2_{t-1} + ß_2 V_{t-1} \qquad (4)$$

3.2 The Growth Model in Jordan Economy

Following-up the technique used by the previous studies which is mentioned above. In addition, the model of the current paper pays attention to two important issues; first, it is design to describe the

case of Jordan economy. Second, the time series data for the econometric investigation is limited[2]. For these two reasons, we use the following model specification to explore the effect of inflation on the economic growth.

$$Y_t = a_0 + a_1 INF_t + a_2 D(INF_t - INF^*) + a_3 GM2_t + a_4 GRGFCF_t + U_t \qquad (5)$$

$$D = \begin{cases} 1 \text{ if } INF_t > INF^* \\ 0 \text{ if } INF_t < INF^* \end{cases} \quad t = 1,\ldots\ldots n.$$

Where Y_t is the annual growth rate of real GDP. INF_t: is the annual growth rate of the inflation rate measured by the percentage change in the consumer price index. D: is a dummy variable that takes the value of one when the inflation rate is greater than the structural break rate and zero otherwise. INF^*: is the inflation rate at which the structural break occurs. $GM2_t$: is the annual growth rate of the money supply (M_2). $GRGFCF_t$: is the annual growth rate of the real gross fixed capital formation. U_t: is the stochastic error. It represents the measurement error in the explanatory variables. In addition, we assume it has a normal distribution with zero mean and constant variance[3].

The coefficient (a_2) measures the effect of inflation rate on the economic growth when it is greater than the assumed structural break level (inflation is high). It is important to mention that the t-statistics needs to be significant to confirm this effect or the structural breakpoint exists. At the same time, the coefficient (a_1) represents the effect of the inflation rate on the economic growth when the inflation rate is below the structural break (inflation is low). Consequently, the sum of the two coefficients ($a_1 + a_2$) represents the annual growth rate of economic growth when the inflation rate is doubled. To find out the structural point, we need to run regression (5) for different values

[2] : The time series for all the variables are available from 1970-2000 which implies we are unable to include many independent variable in order to maintain an acceptable degrees of freedom.

[3] For more details about the significance of this term see Gujarati (1995), pages 30-41.

of INF^*. Then choose the breakpoint, the value of INF^*, that minimizes the residuals sum of squares (RSS) from the regression.

This implies that we are choosing the value of INF^* that maximizes R^2. In this part of the study, I am following-up Sarel (1995) technique. Another important issue in applying the estimation methodology is that to make a decision about the kind of data needs to be use in such model. Often using time series data include the possibility of obtaining spurious regression. To get over this problem, I am using in the regression model, equation (5), the growth rate. This implies I am using the first difference operator that leads to a stationary series. Therefore, the first step will be to test for stationarity of the variables in the model. Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests will be used to investigate if the variables has a unit root or not. Theoretically this topic, whether the data need to be stationary or non-stationary in a multiple regression, is still debatable among the economists.

The stationarity of the time series data is necessary in the case of forecasting, because it is impossible to make forecasting with a non-stationary series. At the same time, converting a series to be stationary, by using the difference, to study the direction of relation among variables may lose a valuable long-term relationship among the variables. Some economists describe that as throwing the baby with the bath water. In the same direction, Sims (1980) and Doan (1992) recommend against differencing in the VAR model even if the variables contain a unit root test. They explain that by saying the goal of the VAR model is to determine the interrelationship among the variables.

4. The Empirical Results

The empirical part of the current study can be divided into two parts; the first one tries to estimate a proxy for inflation uncertainty in the Jordanian economy. And the second one seeks to explore the relation between inflation and the economic growth in Jordan.

4.1 The Uncertainty Proxy

The proxy for uncertainty in the current paper is estimated based on a monthly data over the period 1976:01–2003:10. I relied on estimating a proxy for the uncertainty based on monthly data in order to have enough sample for the estimation process and in order to study the statistical characteristics of the inflation rate in Jordan as shown in Table 3. The inflation rate in Table 3 is measured by the second seasonal (monthly) differencing[4]. The statistics in Table 3 shows based on Jarque-Bera that we can reject the null hypothesis of normal distribution. Kurtosis shows that the probability density function (PDF) for INF[5] is greater than 3 which mean it is leptokurtic (slim or long tailed). Also, the skewness shows the PDF lacks of symmetry and it has a long right tail[6].

Table 3: Summary Statistics

Inflation					
Mean	-0.0033	Std. Dev.	0.0707	ADF in level for inflation	-3.584**
Median	-0.0110	Skewness	1.3328	PP in level for inflation	-4.664*
Maximum	0.3124	Kurtosis	7.484	ADF in level for LNCPI	-1.263
Minimum	-0.2117	Jarque-Bera	351.461	PP for LNCPI	-1.363

Notes: 1- * and ** are significant at 1% and 5% levels, respectively. 2- The ADF and PP tests include constant and linear trend. The estimation for the first seasonally (monthly) differencing of the LNCPI shows that it has unit root, and the ADF test is -2.818 compare to -3.135 at 10% significant level.

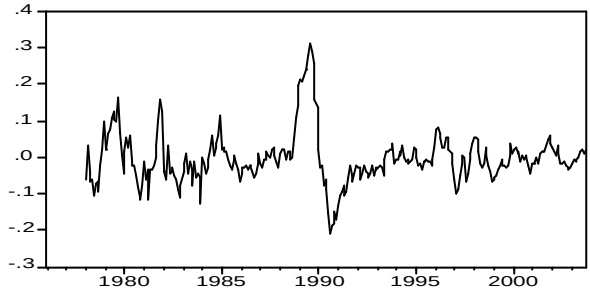
[4] First difference INF = LNCPI-LNCPI (-12), second difference Inflation = INF – INF (-12). The target from using the second difference to make sure that the series is stationary in order to forecast the inflation uncertainty.

[5] The characteristics of INF at yearly level are the same as monthly level.

[6] The normal distribution has the following features skewness = 0, Kurtosis = 3, Jarque-Bera = 0.

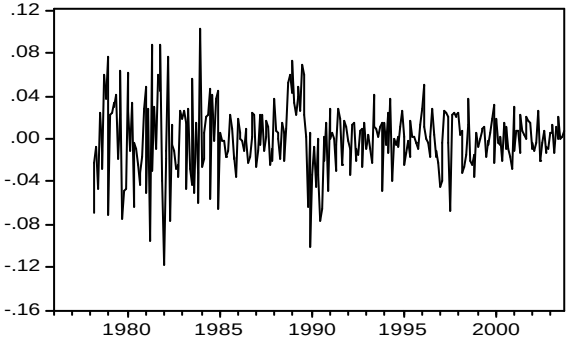
The tests for stationarity, Augmented Dickey-Fuller and Phillips-Perron, show that the inflation series is stationary at both the automatic selection and using specified lags. This feature gives the current paper the necessary condition to estimate the proxy for inflation uncertainty. Figure 1 below illustrates the inflation series. Even looking to Figure 1 can tell that this series is stationary.

Figure 1: The Inflation Series



To make sure that the BJ model is a reasonable fit to the data of inflation we need to test if the residuals from the model are stationary or not. Both the ADF and PP tests show that the residuals are stationary at both the automatic selection and specified lags. Figure 2 illustrate the residuals from the BJ model.

Figure 2: The Residuals from the BJ Model



To make the predication or the estimation of the inflation uncertainty we need first to describe the inflation series by using a model. The best model I find is the Box-Jenkins (BJ) in Table 4.

Table 4: Box-Jenkins Model to Describe the Inflation Series

Dependent Variable: INFLATION. Method: Least Squares
Sample(adjusted): 1978:03 2003:10
Included observations: 308 after adjusting endpoints
Convergence achieved after 15 iterations. Backcast: 1978:02

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.002087	0.014810	-0.140913	0.8880
AR(2)	0.760364	0.037663	20.18843	0.0000
MA(1)	0.995120	0.006755	147.3066	0.0000

R-squared	0.805922	Mean dependent var	-0.0032
Adjusted R-squared	0.804650	S.D. dependent var	0.0708
S.E. of regression	0.031316	Akaike info criterion	-4.0797
Sum squared resid	0.299104	Schwarz criterion	-4.04337
Log likelihood	631.2750	F-statistic	633.267
Durbin-Watson stat	1.957674	Prob(F-statistic)	0.0000

After this step, we can use the ARCH model. The results of estimating the model is in Table 5. Before estimating the proxy of inflation uncertainty, we need to use a residual test which is the ARCH Lagrange Multiplier (LM) test to check whether the variance of the stochastic errors is vary over time (heteroskedastic)[7] or not.

The LM test shows that both the F-statistic and the Obs*R-squared statistic are statistically significant at 4% level. As a result, we can reject the null hypothesis of no ARCH which means that we have a serial correlation between the residuals. Based on the results of the above model, the econometric program can make estimation of the

[7] This is the condition of using the ARCH as stated in the methodology and specifically in equation (3).

conditional variance. Figure 3 below shows the values of conditional variance or what we can call inflation uncertainty.

Figure 3: Inflation Uncertainty

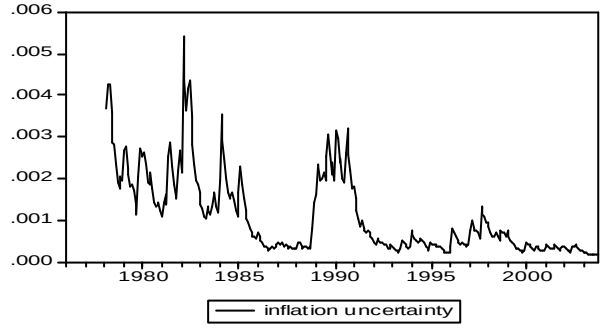


Table 5: The ARCH Model

Dependent Variable: INFLATION. Method: ML - ARCH (Marquardt) djusted: 1978:02 2003:10. Included observations: 309 Convergence achieved after 16 iterations MA backcast: 1977:12 1978:01, Variance backcast: ON				
	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.004022	0.009040	-0.444908	0.6564
AR(1)	0.855992	0.029974	28.55806	0.0000
MA(2)	-0.029238	0.075342	-0.388070	0.6980
Variance Equation				
C	2.30E-05	1.47E-05	1.561583	0.1184
ARCH(1)	0.176909	0.055602	3.181730	0.0015
GARCH(1)	0.798285	0.056140	14.21943	0.0000
R-squared	0.786129	Mean dependent var		-0.003090
Adjusted R-squared	0.782600	S.D. dependent var		0.070769
S.E. of regression	0.032997	Akaike info criterion		-4.285528
Sum squared resid	0.329902	Schwarz criterion		-4.213036
Log likelihood	668.1141	F-statistic		222.7485
Durbin-Watson stat	1.829739	Prob(F-statistic)		0.000000
Inverted AR Roots	.86			
Inverted MA Roots	.17	-.17		

It is clear from Figure 3 that inflation uncertainty fluctuates highly in the periods of high inflation. And this result is logic and expected. Also, the correlation coefficient between inflation uncertainty and inflation rate measured by the first seasonal (monthly) difference of LNCPI is 56.0%.

4.2 Inflation and Growth in Jordan

Exploring the relationship between inflation rate and economic growth in Jordan requires estimating model (5) mentioned earlier. But, before doing this step I would like to have a look at the characteristics of the data used in the model as shown in table 6 below. The summary statistics in Table 6 shows based on Jarque-Bera that we cannot reject the null hypothesis of normal distribution for growth rate of real gross domestic product (GRGDP), growth rate of money supply (GM2) and the growth rate of gross fixed capital formation (GRGFCF). However, it is clear that we can reject this hypothesis for the growth rate of inflation.

This is the same result that the monthly data tells in the previous section of this study. Moreover, the tests for stationarity show that all the three series are stationary based on the ADF test and at different significant levels. At the same time, the PP test shows that both GRGDP and GRGFCF are stationary but both INF and GM2 has a unit root. In this part of the study I will not focus on the stationarity because of two reasons; first, it is very hard to deal with the structural break model with more than one difference or the growth rate. Second, the stationarity of the time series data is necessary in the case of forecasting as I did in estimating the inflation uncertainty in the previous section, because it is impossible to make forecasting with a non-stationary series.

Moreover, converting the series in this model one more time, to be stationary by using the second difference, to study the direction of relation among variables may lose a valuable long-term relationship among the variables that is important to this study.

Table 6: Summary Statistics

	GRGDP	INF	GM2	GRGFCF
Mean	4.014	7.413	14.274	6.291
Median	3.393	6.500	14.999	7.368
Maximum	21.217	25.719	32.638	48.803
Minimum	-16.675	-0.210	-0.909	-33.528
St. Dev	8.368	6.002	9.248	20.121
Skewness	0.003	1.159	0.453	0.162
Kurtosis	3.277	4.202	2.150	2.588
Jarque-Bera	0.098	8.811	1.992	0.355
ADF in level	-3.98**	-3.18***	-4.58*	-4.80*
PP in level	-3.89**	-2.81****	-2.56****	-4.81*

Notes: *, **, *** are significant at 1%, 5% and 10% levels, respectively. **** is insignificant. The ADF and PP tests include constant and linear trend.

Table 7 reveals the results of estimating model (5), by using the ordinary least squares (OLS), without the structural break term. The results demonstrate that the relation between the inflation rate and the economic growth rate in Jordan is strongly negative and statistically highly significant[8]. Table 7 illustrates that, on average, a 1% increase in inflation rate in Jordan leads to a decline in the GRGDP by 0.80%. The t-statistics for the coefficient of inflation rate is not only differ statistically from zero but also highly significant.

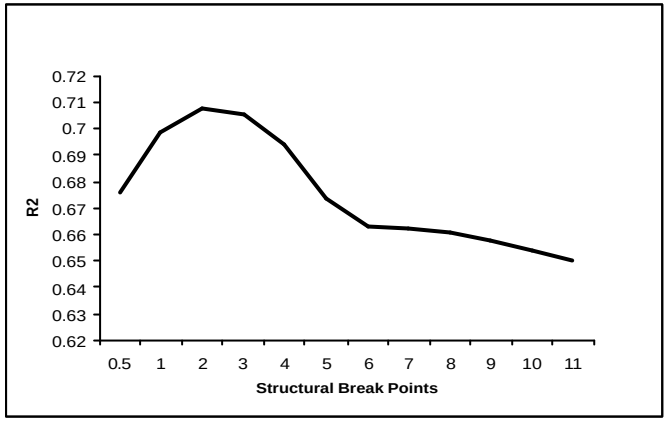
[8] This result is consistent with Maghyereh (2003).

Table 7: Estimating the Growth Model Without the Structural Break Term

Dependent Variable: GRGDP. Method: Least Squares Sample(adjusted): 1970 2000 Included observations: 31 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.908546	1.877932	2.081303	0.0470
INF	-0.802065	0.189695	-4.228173	0.0002
GM2	0.316856	0.132572	2.390074	0.0241
GRGFCF	0.242965	0.053022	4.582391	0.0001
R-squared	0.634029	Mean dependent var		4.014335
Adjusted R-squared	0.593366	S.D. dependent var		8.368204
S.E. of regression	5.336227	Akaike info criterion		6.306829
Sum squared resid	768.8335	Schwarz criterion		6.491859
Log likelihood	-93.75585	F-statistic		15.59212
Durbin-Watson stat	1.642186	Prob(F-statistic)		0.000004

This implies there is a major relation between inflation rate and economic growth in Jordan. Also, the results show a positive and significant relation between GM2, GRGFCF and GRGDP and this result is consistent with the economic theory. To go more in depth inside the relation between inflation rate and economic growth in Jordan, we need to re-estimate the model again with including the structural break as it is shown in equation (5). This process required estimating around 20 regressions, and we are looking to the inflation breakpoint that makes the R^2 maximum or makes RSS minimum. Figure 4 gives an idea about the goodness-of-fit for different structural breaks. It shows the value of R^2 is maximized when inflation structural point is 2.0%.

Figure 4: Goodness-of-Fit for Different Structural Breaks



The results in Table 8 reveal that the structural breakpoint occurs at inflation rate equal to 2%. This means that when inflation rate is less than 2%, its effect is positive and significant. A 1% increase in the inflation rate leads to an increase by 3.27% in the GRGDP. On the other hand, the effect of inflation when it is greater than 2% is negative and significant. A 1% increase in the inflation rate leads to a decrease by 4.32% in the GRGDP. The sum of the two coefficients (-1.05) means the annual growth rate of RGDP declines by 25 percentage points[9] when the inflation rate jumps over the structural breakpoint.

The result in this part of the study gives and important indicator to the central bank of Jordan who should work in a narrow area to keep the inflation rate low and consistent with the definition term of price stability. Using the structural break term methodology is useful to this study, because it proves that the effect of inflation on the economic growth is not only negative but it can also be positive when the inflation rate is 2% and below. This result is important to the CBJ because it shows the range they can work with.

[9] : The structural breakpoint effect add more loss to the GRGDP by an amount equal to the difference between the effect without a structural break minus the effect with the structural break (-0.80- (-1.05) = 0.25).

Table 8. Growth Model With the Structural Break Term

Dependent Variable: GRGDP. Method: Leas Squares Sample(adjusted): 1970 2000. Included observations: 31				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.840975	3.138632	-0.905163	0.3737
INF	3.269072	1.596985	2.047026	0.0509
D(INF-INF*)	-4.324240	1.686323	-2.564301	0.0165
GM2	0.383844	0.123489	3.108329	0.0045
GRGFCF	0.241269	0.048276	4.997740	0.0000
R-squared	0.707903	Mean dependent var		4.014335
Adjusted R-squared	0.662965	S.D. dependent var		8.368204
S.E. of regression	4.858136	Akaike info criterion		6.145877
Sum squared resid	613.6386	Schwarz criterion		6.377165
Log likelihood	-90.26109	F-statistic		15.75289
Durbin-Watson stat	2.053207	Prob(F-statistic)		0.000001

We can look to the result of this study from another direction. It is clear that the structural break point effect occurs at a low inflation rate and within the definition of the price stability term. This result confirms that the inflation is harmful to the Jordanian economy even at the low level. And, the question is why?[10] I believe the answer to this question needs a careful estimation. But the guide line to the answer is related mainly to the structure of the Jordanian economy, causes of inflation and how the government controls the prices. The Jordanian economy is not fully free market economy[11].

The government not only used to monitor and control the prices but also used to support some strategic goods especially some kinds of

[10] : The answer to this question need to focus on the development of the main components of the CPI and the government measures and procedures in the area of the prices during the last three decades.

[11] Jordan economy started the movement toward the market oriented economy as a necessary step consistent with adopting the economic adjustment program at the beginning of 1990's.

necessary goods such as bread and energy. And it is used to announce in advance any anticipated changes in the prices. Therefore, I believe inflation in Jordan represents a change in the relative prices not a change in the aggregate price level. This means that the Jordanians to some extent know in advance that the prices of certain goods will go up. Therefore, I expect that the increase in the prices during the last three decades in the Jordanian economy runs toward affecting mostly the necessary goods that represents a significant portion of the Jordanian basket.

As a result, the ability of the Jordanians to react with economy declines and this restricts their expenditures on the different goods and services. It is useful to mention, from a cultural point of view, that it is hard for some people to adjust their pattern of consumption quickly.

4.3 The Relation between Inflation Uncertainty, Inflation and Economic Growth

This section investigates whether there is a positive relation between inflation rate and inflation uncertainty in Jordan. All the previous empirical studies confirm that this relation is positive. Theoretically, Golob (1994)[12] gives some interesting explanation to this positive relation; he mentioned this variability comes mainly from the monetary policy action to combat high inflation. Within this explanation he talks about the short-term trade off (timing of policy) among the goals of the monetary policy. In another way in case of economic recession or expansion which goal should take immediate priority? In addition, he talks about the time lag or speed and size of effect from the monetary policy action to the inflation rate is uncertain. To test the relation between inflation, money supply and inflation uncertainty (UNC) in Jordan, empirically, I will run a multiple regression including those three variables. Table 9 below shows the results of the regression.

[12] Also, Ball (1992) explains the positive relation between inflation and inflation uncertainty to policy-maker action.

Table 9: The Relation between Inflation Uncertainty and Both Inflation and Money Supply Growth

Dependent Variable: UNC
Method: Least Squares
Sample(adjusted): 1978 2000
Included observations: 23 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.147665	0.248941	0.593172	0.5597
INF	0.070510	0.023820	2.960113	0.0077
GM2	0.049995	0.017590	2.842296	0.0101

R-squared	0.577592	Mean dependent var	1.21136
Adjusted R-squared	0.535351	S.D. dependent var	0.90758
S.E. of regression	0.618658	Akaike info criterion	1.99858
Sum squared resid	7.654764	Schwarz criterion	2.14668
Log likelihood	-19.98368	F-statistic	13.6737
Durbin-Watson stat	1.603505	Prob(F-statistic)	0.000181

It is clear from Table 9 that there is a positive and highly statistically significant relation between inflation and inflation uncertainty and this confirms the results of the previous studies. In addition, the result regarding the relation between inflation uncertainty and money supply confirms the explanation mentioned by Golob (1994). The result illustrates a positive and highly statistically significant relation between those two variables. These empirical results are important indicators to the monetary policy in Jordan. It says that the monetary authority suppose to be accurate and careful when trying to control inflation. These results support the economic thought that the central bank of Jordan should conduct its policy, regarding inflation, by rules not by discretion.

According to the relation between inflation uncertainty and economic growth, the correlation coefficient matrix in Table 10 among the variable GRGDP, INF, UNC, GM2 and GRGFCF shows that the relation is weak compare to the relation between inflation and economic growth and the other variables. This result implies that the effect of inflation on economic growth in the Jordanian is more important compare to the effect of inflation uncertainty which I consider is halted because of the government control.

This result is reasonable if we take into consideration that, on average, the inflation rate in Jordan is still one-digit number. I believe that the reasons behind this result are: First, the price of some goods and services, specially the necessary goods[13], are subject to government policy control or intervention. Second, the inflation rate in Jordan, on average, is one-digit inflation which gives the public the confidence of not exceeds this rate.

The data illustrates that the inflation rate during the period 1970-2000 is 7.0%. Therefore, businessmen and consumers make their decisions based on the inflation rate because it is relatively expected within a range specifically when the government announces in advance a new adjustment on the prices of certain goods and services. This advance announcement reduces the effect of inflation uncertainty because it helps the consumers to predict the new price level. But, the main effect is the effect of the new inflation rate on the economic growth which is proved in this study to be negative. The weak relation between inflation uncertainty and economic growth could be a positive sign or result to the Jordanian economy. Because it confirms that the inflation rate is the only variable among the two that threaten the economic stability. Also, Table 10 confirms all the abovementioned relation specially the strong positive relation between inflation uncertainty (UNC) and GM2 as stated in Table 9.

Table 10: The Correlation Coefficient Matrix

	GRGDP	**INF**	**UNC**	**GM2**	**GRGFCF**
GRGDP	1.00	-0.4265	0.0648	0.1754	0.5981
INF	-0.4265	1.00	0.6379	0.3843	0.0183
UNC	0.0648	0.6379	1.00	0.6265	-0.0538
GM2	0.1754	0.3843	0.6265	1.00	0.2310
GRGFCF	0.5981	0.0183	-0.0538	0.2310	1.00

[13] Despite that the Jordanian economy is a market oriented economy but the government still controls some of the necessary goods such as bread and energy.

5. Summary and Conclusion

This paper focus on the effect of inflation uncertainty on economic growth as a potential factor that may magnify the effect of inflation or even may be more important than the inflation itself. The historical overview shows that Jordan applied a tight monetary policy as a result of an economic shock or crises at the end of 1980s. This policy helps to keep inflation low and stable. But, many economists asked an important question which is "For how many years this monetary policy can sustain, especially it is costly and the Jordanian economy is looking forward to develop its financial market." The central bank of Jordan (CBJ) started from 1999 to move toward more easy policy which leads to decrease the interest rate from around 9.0% to 3.0%. This policy is expected to have a direct effect on the inflation rate in Jordan. Therefore, inflation is expected to be an important phenomenon in Jordan.

This study comes to asses the effect of inflation on economic growth. The results of this paper can be summarized as follows; first, generally, the relation between inflation and economic growth in Jordan is negative. But, using the structural breakpoint methodology proved that this relation tend to be positive below an inflation rate equal to 2%. And after this low level the effect tend to be negative. Second, the relation between inflation and inflation uncertainty in Jordan is positive. This result is consistent with all the previous studies. But the important addition to this relation is that; in case of Jordan inflation rate affects the economic growth strongly and significantly while the effect of inflation uncertainty is insignificant and weak.

Those two conclusions may be due to the fact that inflation above 2% in Jordan will reduce the purchasing power of the Jordanians. Taking into consideration that the inflation rate is not indexed in the wages and salaries. And this leads to decrease the consumption spending. Moreover, the effect of inflation uncertainty is insignificant due to the fact that the public knows the government attitude to control and support the prices of the necessary goods. Third, the

monetary policy in Jordan not only affects the inflation rate significantly but also inflation uncertainty.

In sum, the monetary policy in Jordan plays an important role in pushing the economic growth. But, at the same time, it has a positive effect on both inflation uncertainty and inflation rate. The latter not only has a negative effect on the economic growth but also its effect is greater than the positive effect of the monetary policy on the economic growth. Despite the above-mentioned results of this paper is a bad news to the Jordanian economists but this paper has also some good news. The good news is that the effect of inflation on the economic growth in Jordan is positive below inflation rate equal to 2.0%.

This result gives the central bank a very limit area to maneuver. And, the second part of the good news is that inflation uncertainty doesn't have a negative effect on the economic growth. Therefore, at the present time the central bank of Jordan needs to pay attention to the inflation phenomenon while conducting an easy monetary policy that adopted to develop the financial market.

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