THE RELATIONSHIP BETWEEN THE INFLATION RATE AND ITS VARIABILITY : SOME EMPIRICAL EVIDENCE FROM THE ARAB GULF REGION

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I. Introduction

This paper examines the relationship between inflation and inflation variability in two Arab Gulf countries namely, Saudi Arabia and Kuwait. The importance of this relationship was recognized by Friedman (1977) in his noble lecture, where he argued that higher inflation results in greater uncertainty about future inflation. This in turn shortens the average duration of contracts and distorts the price system, leading to higher unemployment and a lower rate of real output.

The two countries examined here experienced high inflation rates during the oil boom years relative to the rest of the World. For example, during 1972-76, inflation averaged 22.9% in Saudi Arabia and 8.3% in Kuwait. During this same period, world inflation ranged between a low of 7.4% and a high of 16.5% (Harberger, 1978).

Aside from the fact that the inflation experiences of Saudi Arabia and Kuwait have not been studied previously, to date empirical research on the issue of the rate and variability of inflation has not been conclusive. Some investigators have found a positive relationship (see, for example: Okun, 1971; Logue and Willett, 1976; Foster, 1978; Blejer, 1979; Khan and Abbas, 1983; Glezakos and Nugent, 1984; Pagan, Hall and Trivedi, 1983; Ram, 1985; Golel and Ram, 1993; and Park, 1995). Others have failed to establish a relationship (see, for example, Gordon, 1971; Gale, 1981; Katsimbris and Miller, 1982; and Katsimbris, 1985). The topic thus merits further study.

The common measure of inflation variability used in the literature is the standard deviation of the rate of inflation or some moving averages of observed inflation. However, as noted especially by Glezakos and Nugent (1984), these measures are mechanical and have no clear theoretical relationship to the

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hypothesis under study. Accordingly, in this paper, we follow Pagan, Hall and Trivedi (1983) in measuring inflation variability by the squared value of the difference between expected and actual inflation, where expectations are formed rationally. Most of the existing literature on the relationship between inflation and its variability is based on cross-section data. This may be suspect for many reasons, in particular the countries pooled may differ in their economic structures. Ram (1985), for example, found that cross-section results are very sensitive to the choice of the period and the classification criteria suggesting that caution is needed in interpreting the empirical results. Therefore, this paper employs time series data.

We begin in section II by describing a rational expectations model that can be used to study the relationship between inflation and inflation variability. Section III presents the results, and section IV concludes.

II. The Theoretical Framework

For our purpose, inflation variability is measured by the squared unanticipated error of forecasting inflation. That is:

$$V(t) = [\Pi^e(t)]^2, \qquad \text{..........(1)}$$

where V is the measure of inflation variability and Π^e denotes unanticipated inflation and is defined as the difference between the observed and expected inflation rate. This measure of price variability is generated from the following rational expectations model of inflation;[1]

$$\Pi(t) = \lambda X(t-1) + \varepsilon(t), \qquad \text{..........(2)}$$

where Π is the rate of inflation[2], X(t - 1) is the vector of all information deemed relevant by economic agents in the formation of expectations, and ε is an error term. The information set includes past rates of inflation and the lagged values of some macroeconomics variables such import prices, real GDP growth, world inflation, and the growth of narrow money supply (M1)[3]. To determine which of these independent variables to include and their optimal lags, I use Akaike's (1969) procedure which is based on the minimization of final prediction errors (FPE)[4]. First, to determine the optimal own lag of inflation the procedure requires that we minimize FPE which is defined as;

$$FPE(n) = [(T+n+1)/(T-n-1)].[RSS(n)/T],$$

where T is the number of observations, n is the length of the lag which is set at a maximum of 3 years given the size of the sample, and RSS is the sum of squared residuals. Then, I chose the Lag(n*) which minimizes FPE(n). Given lag (n*), the next step is to run a series of bivariate regressions, each containing the optimal own lag and one of the remaining independent variables. For each independent variable (say import prices), I calculate:

$$FPE(n^*, k) = [(T+n^*+k+1)/(T-n^*-k-1)].RSS(n^*, k),$$

where k(=1,2,3 years) is the lag length on the import prices variable. As before, the optimal lag (k^*) is that which minimizes FPE (n^*, k). If FPE (n^*, k^*) is greater than FPE (n^*), then import prices do not Granger-cause inflation, as has been shown by Hsiao (1981), and thus it is dropped from the model. This step is repeated for the remaining independent variables one at a time. Then, I estimate a set of trivariate regressions, which include the optimal own lag, the variable with the minimum FPE among all bivariate regressions, and a third variable from the remaining independent variables. The last step is repeated until all independent variables are either included in the model or dropped.

Now to test the hypothesis that inflation leads to higher price variability, the time-series estimates of V, obtained from equation (2), are used to estimate the following linear regression model:

$$V(t) = \beta_0 + \beta_1 \Pi(t) + \mu(t) \qquad \text{.........(3)}$$

.where V is the measure of inflation variability and is defined as before, Π is the inflation rate, and μ is the error term[5].

III. Data and Empirical Results

Using annual data from Saudi Arabia and Kuwait for the period 1972-92, equations (2) and (3) have been estimated for each of the two countries with ordinary least squares(OLS)[6]. The results are reported in Tables 1 and 2. It appears from Table 1 that the fit of the expected inflation equation, as measured by the adjusted $\overline{R}^2$, is satisfactory for both Saudi Arabia and Kuwait and is significant at least at the 5% level. Also, the coefficients of the lagged independent variables, domestic inflation and imported inflation in the case of Saudi Arabia and domestic inflation, world prices, and money growth in the case of Kuwait, have the correct signs and are significant. Further evidence supporting the statistical adequacy of this equation is given by the following diagnostic tests. The Durbin-m and the Bruesh-Godfrey statistics suggest the absence of serial correlation. The F-statistic of the Farely-Hinich test fails to reject the null hypothesis that the expected inflation equation is structurally stable [F = 4.22 for Saudi Arabia; and F = 1.42 for Kuwait].

Table 1
Regression Results from Equation (2)

Country	Constant	Lagged Independent Variables				
Saudi	C	Π(-1)	Dpm(-1)	Dpm(-2)		
Arabia	-0.01	0.48	0.01	0.36		
	(-1.46)	(4.6)	(0.07)	(2.46)		
Kuwait	C	Π(-1)	Π(-2)	Dwp(-1)	Dm1(-1)	Dm1(-2)
	-0.07	-0.64	0.74	0.64	0.089	0.12
	(-1.52)	(-2.45)	(2.41)	(2.78)	(1.6)	(2.20)

notes: Π = inflation rate, dpm = import inflation, dwp = world inflation, and dm1 = narrow money growth; figures in parentheses are the absolute values of the t-statistic.

Table.1 (continued).

Country	D - W	Adjusted R^2	Regression F-statistics	Standard error of the regression	Bruesh-Godfrey (x^2)	Durbin-m
Saudi Arabia	1.86	0.78	20.22	0.0335	5.36*	0.48*
Kuwait	1.90	0.47	3.8	0.0341	4.27*	-0.25*

* Statistically insignificant at least at 5% level, implying that there is no problem of serial correlation.

Having established the adequacy of the inflation-generating equation, we turn now to Table 2 which reports the results from equation (3) describing the relation between inflation and its variability.

Table 2
Regression Results for Equation (3)

	Regression coefficients					
Country	β_0	β_1	$\overline{R}^2$	D - W	$\overline{\Pi}$	S.E
Saudi.Ar	0.0005	0.01	0.33	2.37	5.48	0.0009
	(2.39)	(3.0)*				
Kuwait	0.0002	0.01	0.24	2.11	5.24	0.0155
	0.84	(2.48)*				

notes : $\overline{\Pi}$ = average inflation rate, S.E is the standard error of the regression,?? = the coefficient of determination corrected for degrees of freedom, and D-W=Durbin-Watson; values of the t-statistic are in parentheses.

* Statistically significant at the 5% level.

It is evident that the coefficients of inflation in the two countries are positive and significant at the 5% level. This finding is supportive of Friedman's hypothesis that higher inflation leads to higher inflation variability. It is also noteworthy that the two slope coefficients are significantly less than unity, which accords with the findings of Glezakos and Nugent (1984) and, is in contrast with Blejer's (1979) finding of slope coefficients greater than unity for all the countries in his sample.

V.Conclusions and Implications

This paper presents evidence on the relationship between inflation and its variability by using annual data from Saudi Arabia and Kuwait for the period 1972-92. Inflation variability is measured by the squared difference between actual and expected inflation, where expectations are formed rationally. The results point to a positive and significant relationship between these two variables, which supports a large body of previous research. An important implication of our results is that the governments of the two countries should avoid inflationary policies that could lead to inflation variability and in turn lower the efficiency of resource allocation. Instead they should aim at low rates of inflation through clear monetary policy rules and other inflation reducing measures. It is also important that these governments' policies be credible in the eyes of economic agents if these agents are to lower their expectations of inflation.

NOTES

1. Results from using an adaptive expectations model are similar to those derived from the rational expectations model used in the paper.
2. $\Pi = (Pt\text{-}P(t\text{-}1))/P(t\text{-}1)$ where Pt is the consumer price index (CPI).
3. Lack of data on both the exchange rate and interest rates precluded their inclusion in the model.
4. On this procedure, see for example, Darrat and Lopez (1988).
5. Similar results were obtained when inflation variability is measured by the absolute instead of the squared difference between observed and expected inflation.
6. The inflation rate is measured by the annual percentage change in the CPI; data on the price indexes are from, IMF, *International Financial Statistics* (IFS).

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