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Price Levels and Exchange Rates: The Case of Kuwait

John Pippenger and Yousuf Hasan J. Mohammad*

Professor, Economics Department, University of California, Santa Barbara, U.S.A. and

**Assistant Professor, Economics Department, Kuwait University, Kuwait*

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Abstract. Although the Kuwaiti price index, unlike the other price indexes we use, is stationary, the authorities have not tried to maintain a constant price level in Kuwait. They have accepted or tolerated a rate of inflation that is about the same as in Germany and Japan, which are its least inflationary major trading partners. Although officially the dinar is pegged to an unspecified basket of currencies, apparently the authorities are willing to tolerate substantial long-run movements in the dinar value of important currencies such as German marks and Japanese yen. There is, however, evidence that the central bank keeps prices of dollars within a fairly narrow range. There is no evidence that the Kuwaiti authorities discretely adjust exchange rates. Instead they appear to moderate short-run movements in the dinar price of U.S. dollars, but not other currencies.

Whatever may have been the goal of the Central Bank of Kuwait in the foreign exchange market, the most obvious result of its policies has been the stabilization of the dinar price of dollars in real terms. As a result of the stability of dinar-dollar rates in renal terms, real dinar exchange rates for other currencies essentially reflect their real dollar values.

Introduction

Most small open countries impose controls on foreign exchange and international capital flows. As a result, almost all reseach on the operation of foreign exchange markets has concentrated on large countries which no longer impose such controls. Kuwait, however, provides an outstanding opportunity to study the foreign exchange market in a small country without restrictions on foreign exchange or international capital flows. In this paper we use this opportunity to analyze the relation between price levels and exchange rates.

The monetary authorities in Kuwait appear to have at least two goals that are important for our analysis of the relation between Kuwait price levels and dinar exchange rates: They want a stable price level in Kuwait and a stable exchange rate. These two goals can conflict with each other, particularly for a small country that is

highly integrated into world commodity and capital markets as is Kuwait. In the long run, which would include decades if not years, a stable exchange rate implies that the price level in Kuwait must move more or less in step with price levels of its major trading partners. If dollar prices of consumer goods rise 10 percent and exchange rates are constant, dinar prices of most consumer goods must rise by approximately 10 percent. In the short run, which includes months and possibly years, this link is much weaker and it is possible to pursue both goals simultaneously, particularly if the authorities are willing to experience substantial changes in reserves of foreign exchange. Given these constraints, our first objective in analysing the data is to obtain an understanding of how the central bank tries to balance these two potentially conflicting objectives.

Data

The *Quarterly Statistical Bulletin* published by the Central Bank of Kuwait does not show wholesale price indexes for 1984, 1985 and part of 1986. As a result, we are forced to use consumer price indexes as our measure of monthly price levels in Kuwait. In order to be consistent, we also use consumer price indexes for the United States, Germany, Japan and England. All exchange rates are monthly averages of daily rates.[1] The consumer price index for Kuwait and the monthly dinar price of dollars are from the *Quarterly Statistical Bulletin* published by the Central Bank of Kuwait. Consumer price indexes for Germany, Japan, Great Britain, and the United States, and monthly dollar exchange rates for marks, yen and pounds are from *International Financial Statistics* published by the International Monetary Fund. Monthly dinar prices of marks, pounds and yen are obtained from dinar price of dollars using mark, pound or yen prices of dollars. The data cover the period from February, 1982 to December, 1988.

Exchange rate versus price level stability

Table 1 summarizes long-run growth rates for consumer price indexes for Kuwait, Germany, Great Britain, Japan and the United States and long-run growth rates for dinar prices of marks, pounds, yen and dollars. The annual growth rates reported in Table 1 are obtained from regressing the log of price indexes or exchange rates against time.

Growth rates for price in Japan, Germany and Kuwait are roughly the same, about 1.5 percent per year. The average growth rate for Britain is three times that for Kuwait and the U.S. falls about midway between Kuwait and Britain.

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[1] Using monthly averages rather than end of month exchange rates, as is more common, partly compensates for the fact that exchange rates are determined in highly volatile auction markets while prices in the CPI are from non-auction markets where prices show more inertia.

Table 1. Annual growth rates for consumer price indexes and exchange rates: percent per annum: February 1982 to December 1988

Country	Consumer price index	Exchange rate
Japan	1.2	11.3
Germany	1.3	6.3
Kuwait	1.4	NA
U.K.	4.5	0.6
U.S.	3.2	−0.7

Since average growth rates over seven years can hide as much as they reveal, Fig. 1 through 4 plot the Kuwaiti consumer price index against each of the other consumer price indexes. In 1982 and early 1983 prices rose faster in Kuwait than in the U.S. but after 1983 inflation is more rapid in the United States. Through 1982 and 1983 price rose at about the same rate in Kuwait and Britain. After 1983 prices continued to rise rapidly in Britain, but in Kuwait the rate of inflation declined. As compared to Germany and Japan, prices rose a bit faster in Kuwait during 1982 and 1983, but after that, the rates of inflation appear very similar.

With respect to average rates of change in exchange rates reported in Table 1, there is almost no trend in the dinar price of the dollar or pound. The difference between the trend rates of change for dollars and pounds, 1.3 percent, is exactly the same as the difference between trend rates of change in consumer price indexes for the United States and Great Britain. For the mark, the trend rate of growth in the dinar price is about ten times larger than for the dollar, and for the yen it is almost twenty times as large.

Average rates of change in exchange rates hide a complex pattern of appreciation and depreciation. As Fig. 5 shows, from 1982 through 1984 dinar prices of dollars rose, but then generally fell, with some temporary recoveries, for the rest of the period. In Fig. 6 dinar prices of the pound fall until early 1985 and then generally rise over the rest of the period. Dinar prices of marks show a similar pattern in Fig. 7, but the fall is less and the rise much stronger. In Fig. 8 the dinar price of yen is quite stable through mid 1985, and then rises steeply.

Using February 1982 as the base period, Figs. 9 and 10 show the real Kuwaiti dinar price of dollars, marks, pounds and yen. These real rates are derived by dividing the dinar price of a currency by the appropriate ratio of consumer price indexes. Real dinar exchange rates for the dollar fluctuate within a fairly narrow range, less than plus or minus 10 percent. Other real exchange rates fluctuate over a much larger range. A comparison of the movement in exchange rates and relative price indexes shown in Figs. 5 through 8 reveal the source of the different patterns in real exchange

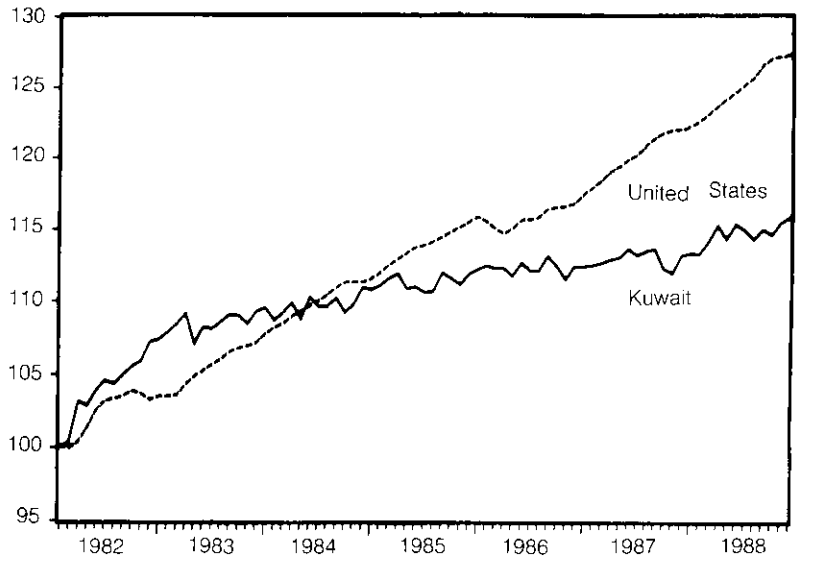

Fig. 1. Consumer price indexes for Kuwait and the U.S.: February 1982 equals 100.0

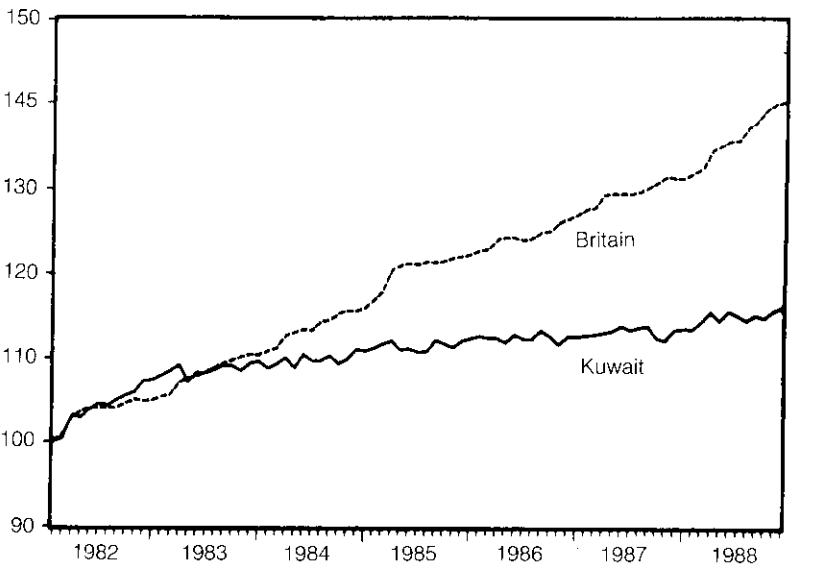

Fig. 2. Consumer price indexes for Kuwait and Britain: February 1982 equals 100.0

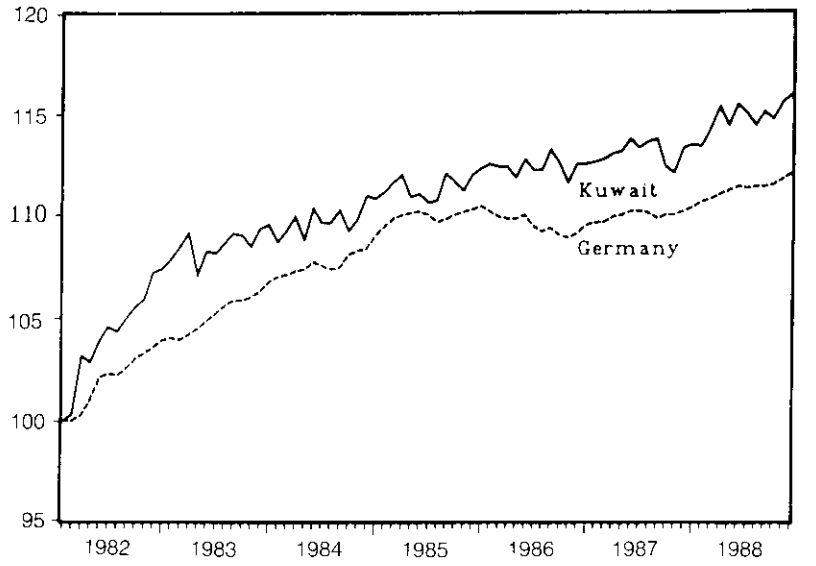

Fig. 3. Consumer price indexes for Kuwait and Germany February 1982 equals 100.0

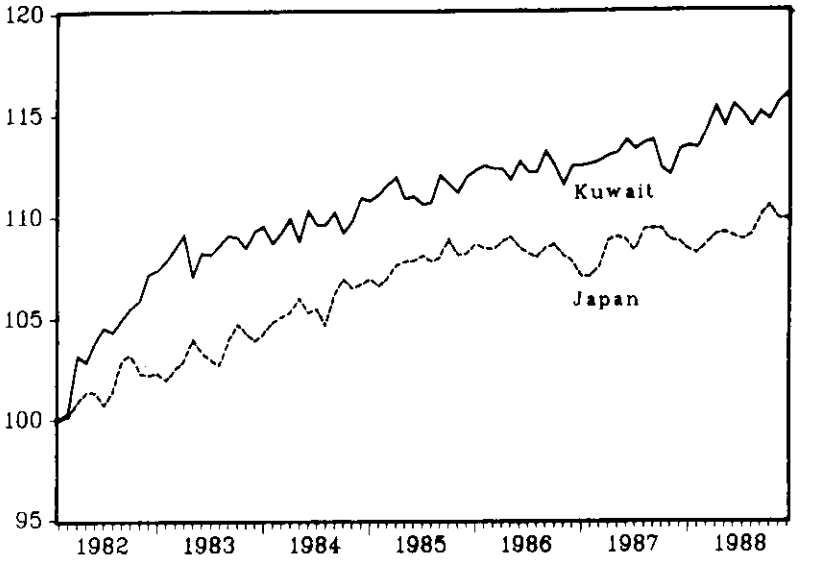

Fig. 4. Consumer price indexes for Kuwait and Japan: February 1982 equals 100.0

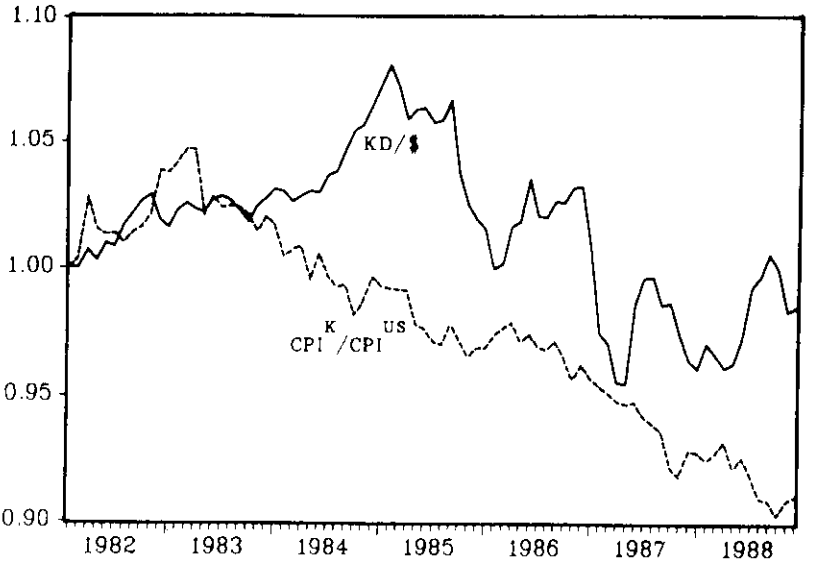

Fig. 5. Dinar price of dollar and ratio of Kuwait to U.S. CPI: February 1982 equals 1.0

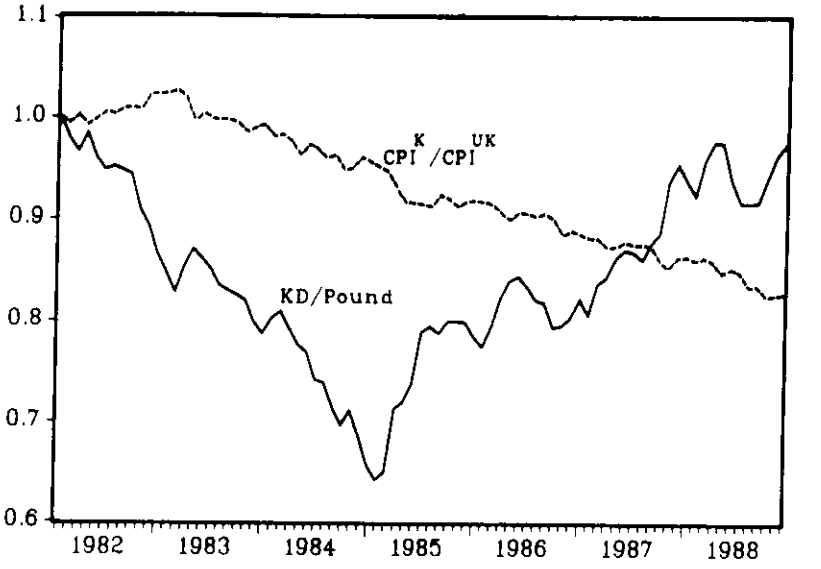

Fig. 6. Dinar price of pound and ratio of Kuwait to British CPI: February 1982 equals 1.0

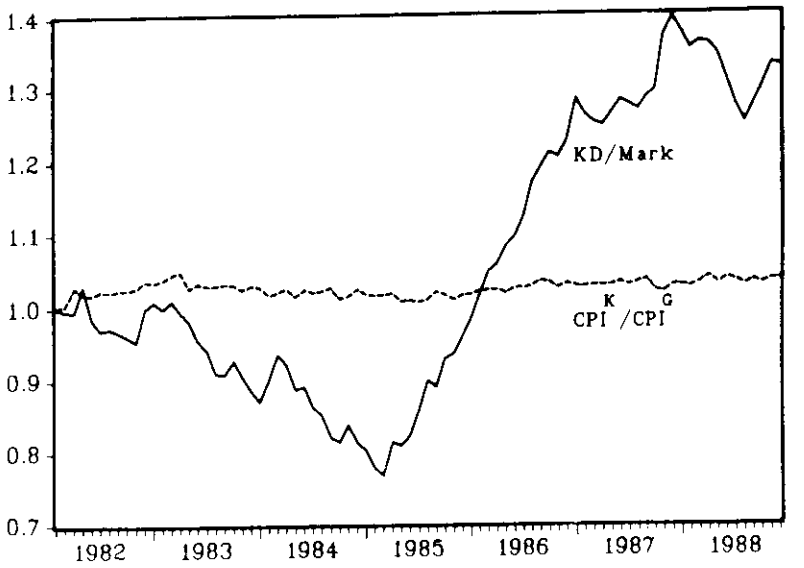

Fig. 7. Dinar price of mark and ratio of Kuwait to German CPI: February 1982 equals 1.0

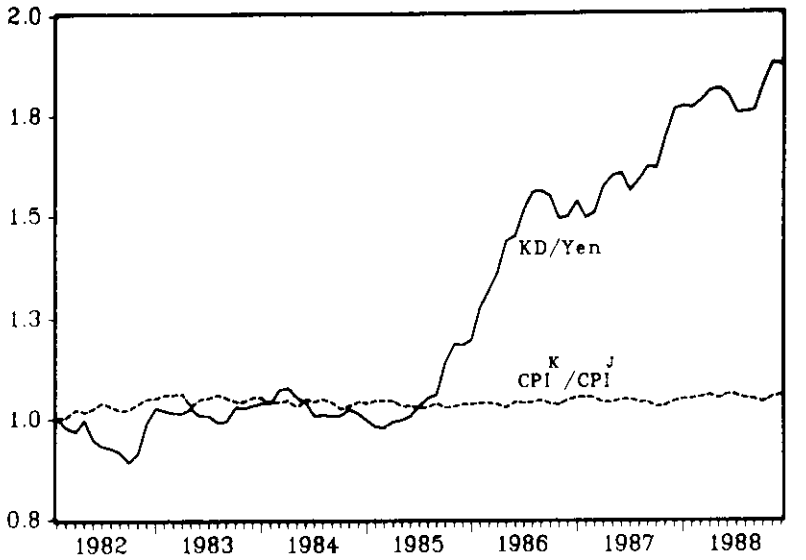

Fig. 8. Dinar price of yen and ratio of Kuwait to Japanese CPI: February 1982 equals 1.0

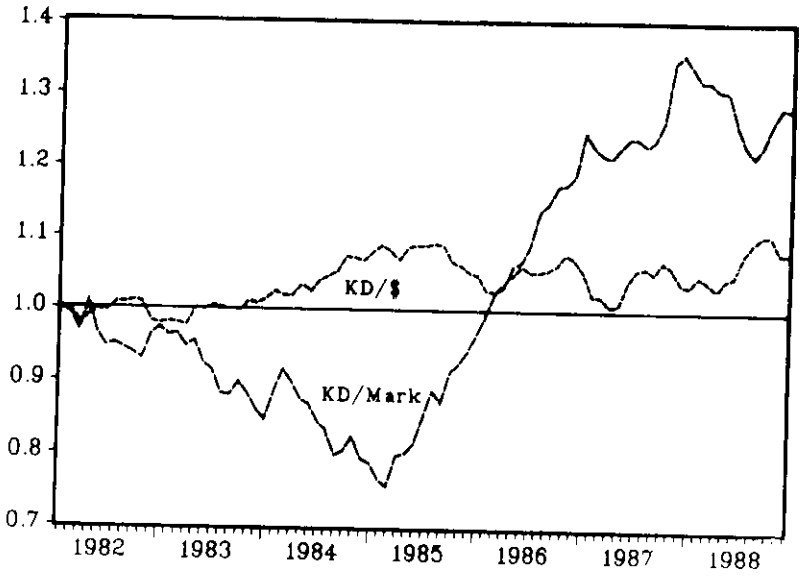

Fig. 9. Real exchange rates for dollars and marks: February 1982 equals 1.0

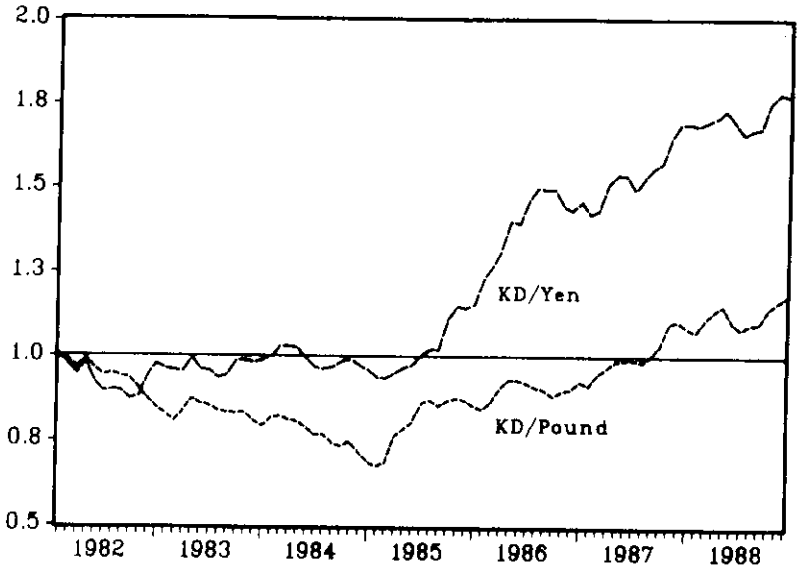

Fig. 10. Real exchange rates for pounds and yen: February 1982 equals 1.0

rates. Dinar prices of the dollar and the ratio of Kuwaiti to U.S. price indexes tend to move in the same general direction. On the other hand, British prices rise almost continuously relative to Kuwait prices while the dinar price of pounds first falls sharply and then quickly recovers. Prices in Germany and Japan hardly vary relative to Kuwait, but exchange rates fluctuate widely.

The wide variation in real dinar prices of marks, pounds and yen is primarily the result of the large fluctuations in real dollar prices of those currencies. Figs. 11 through 13 compare real dinar prices of those currencies to their real dollar prices. In each case the movements of real dinar and dollar prices are almost identical.

Officially the nominal value of the dinar is pegged to an unspecified basket of currencies. *Defacto,* the real value of the dinar apparently is pegged to the dollar. As a result, fluctuations in real dinar prices of other currencies simply reflect movements in real dollar prices of those currencies. It is not clear whether or not pegging the real value of the dollar has been a conscious goal of the authorities or simply the result of their efforts to achieve other golas such as domestic price stability and stable dinar-dollar exchange rates.

Purchasing power parity

The conventional approach for evaluating the relation between exchange rates and relative price levels is to run a regression with exchange rates as the dependent variable and ratios of price indexes as the independent variable. More recently, researchers have used tests for error correction and cointegration. However, as Davutyan and Pippenger [1,2] show, the results from all these tests can be misleading. The subsection on transaction costs discusses how such tests can mislead.

Equation 1 describes a typical test equation for purchasing power parity.

$$R_t = \alpha + \beta P_t \tag{1}$$

where R_t is the log of the exchange rate, e.g., the log of the dinar price of dollars, and P_t is the log of a ratio of price indexes, e.g., the log of the Kuwaiti consumer price index divided by the U.S. consumer price index. Under this formulation, α represents the log of the base period equilibrium exchange rate.

Table 2 shows least squares regressions for this equation using dinar prices of dollars, pounds, marks and yen, and appropriate ratios of consumer price indexes. The regressions use a variant of the Cochrane-Orcutt technique. The high R^2s are spurious in the sense that they reflect the information in the structure of the error term. If the series were simply quasi differenced to remove the structure in the error term, the R^2s would drop to close to zero. Only one regression coefficient is signific-

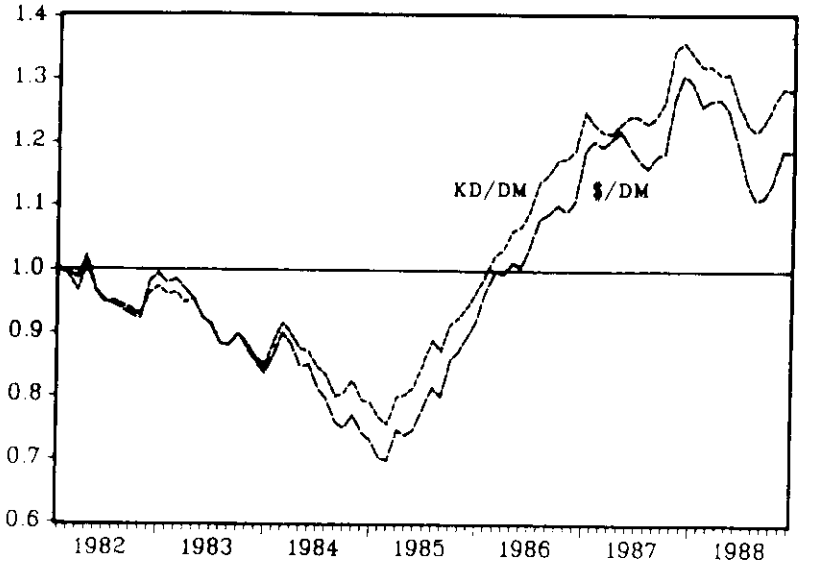

Fig. 11. Real exchange rates for KD/DM and $/DM: February 1982 equals 1.0

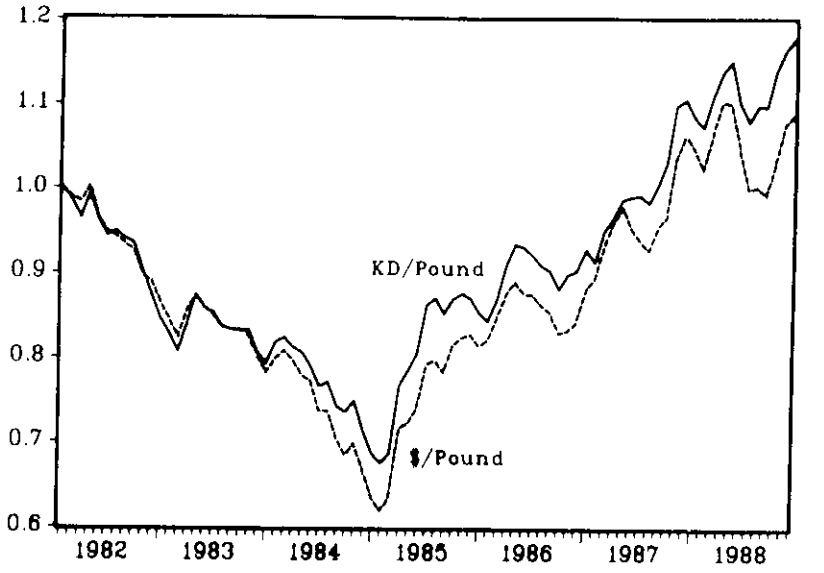

Fig. 12. Real exchange rates for KD/Pound and $/Pound: February 1982 equals 1.0

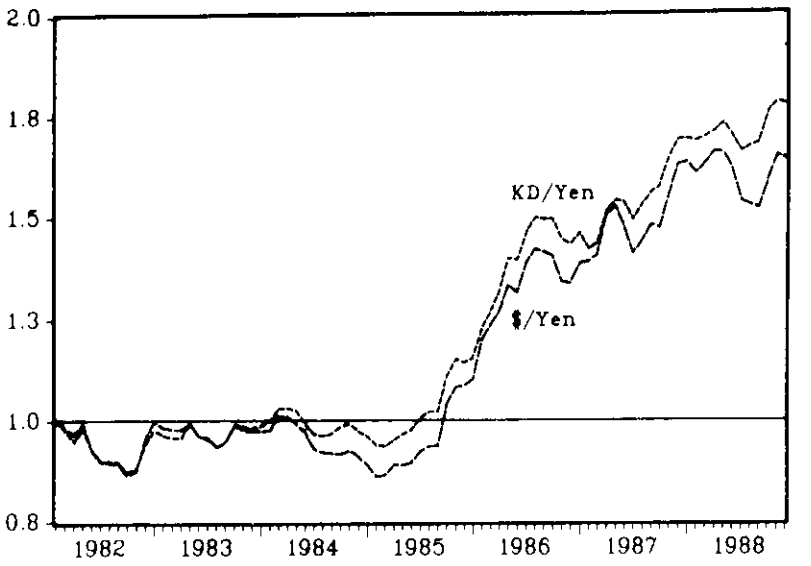

Fig. 13. Real exchange rates for KD/Yen and $/Yen: February 1982 equals 1.0

antly different from zero, the British pound, and it is negative. Table 2 suggests that there is no direct relation between relative price levels and exchange rates. Purchasing power parity appears to fail completely.

Table 2. Purchasing power parity estimates: February 1982 to December 1988

Currency	α	β	R^2/S.E.	ρ/DW
U.S. dollar	5.70††	−0.42	0.895	0.924
	(231.16)	(1.89)	0.009	1.387
British pound	6.04††	−0.96†	0.951	0.948
	(105.05)	(3.05)	0.023	1.536
German mark	13.79	0.27	0.999	0.999
	(0.48)	(0.70)	0.024	1.519
Japanese yen	3.48	−0.15	0.989	0.998
	(0.71)	(0.49)	0.025	1.316
Simulated data				
No neutral band	5.55††	−0.20	0.027	0.0
	(9.68)	(1.65)	0.010	1.020
Neutral band	4.43††	0.04	0.001	0.0
	(8.85)	(0.40)	0.015	0.419

*t statistics in parentheses.
† Significant at the 5 percent level. †† Significant at the 1 percent level

Cointegration

Since exchange rates and relative price levels often appear to be martingales, tests of purchasing power parity using equation 1 are subject to spurious correlation. As a result, a number of recent studies of purchasing power parity use tests for error correction or cointegration. Some of these studies include Baillie and Selover [3], Corbae and Ouliaris [4] and Enders [5,6]. For a discussion of the tests for error correction and cointegration see Engle and Granger [7] and Engle and Yoo [8].

Suppose x_t and y_t are 1(d) where d is the number of times x_t and y_t must be differenced in order to make them stationary time series. If there is a linear combination of x_t and y_t that requires less differencing in order to be stationary, then x_t and y_t are cointegrated.

More formally, let ε_t be a linear transformation of x_t and y_t

$$\varepsilon_t = \phi_1 x_t + \phi_2 y_t \tag{2}$$

If there exists a parameter vector ϕ for which ε_t in equation 2 is I (d − b) with b greater than zero, then x_t and y_t are cointegrated of order, d, b. See Engle and Granger [7]. If d minus b equals zero, then the time paths for x_t and y_t tend to converge in the long run.

Suppose x_t is a martingale and a proportional error correction process constrains the deviation between x_t and y_t.

$$x_t = x_{t-1} + n_t \tag{3}$$

$$\Delta y_t = -\lambda (y_{t-1} - x_{t-1}) + u_t \tag{4}$$

where n_t and u_t are white noise error terms and λ is none negative, but less than one. Since x_t is a martingale, it is I(1) and has a unit root, y_t als is a none stationary process because it is the sum of a stationary and none stationary process.

$$y_t = \left[1/[1 + (\lambda - 1)L] \right] u_t + \left\{ \lambda L/\left([1 + (\lambda - 1)L][1 - L]\right) \right\} n_t$$

where the first term on the right hand side is a stationary process and the second is nonstationary. Because of the error correction mechanism, x_t and y_t are cointegrated, and the difference between x_t and y_t is a stationary stochastic process.

$$y_t - x_t = (1 - \lambda)(y_{t-1} - x_{t-1}) + u_t \tag{5}$$

Rewriting equation 5 yields an expression that is closely related to the test for unit roots discussed next.

$$\Delta(y_t - x_t) = -\lambda(y_{t-1} - x_{t-1}) + u_t \qquad (5')$$

If λ is greater than zero and less than one, $y_t - x_t$ is stationary. If λ is zero, $y_t - x_t$ is a martingale, which is not stationary.

Engle and Granger [7] suggest the following procedure for testing for cointegration. First run an ordinary least squares regression between x_t and y_t, and then establish the root for the error from that regression. In the example used above, which is applicable to purchasing power parity, if the error is a stationary process, the two series are cointegrated.

The first step in testing for cointegration is to confirm that the series are not stationary. Two stationary time series are trivially cointegrated. Using x_t as an example, the first step is to run the following regression:

$$\Delta x_t = \alpha_0 + \alpha_1 T + \alpha_2 x_t + \sum_{i=1}^{m} \beta_i \Delta x_{t-1} + \varepsilon_t \qquad (6)$$

where ε_t is assumed to be an identically distributed random variable, T is a time trend, and here m equals 2.

The null hypothesis is that x_t has a unit root, which implies that α_2 in equation 6 equals zero. For example, applying 6 to x_t in equation 3, which is a martingale, yields estimates of α_0, α_1 and α_2 that equal zero. The statistic $\hat{\tau}_t$ proposed in Dickey and Fuller [9] for testing the hypothesis that α_2 equals zero is given by the t statistic for α_2. Critical values for the augmented Dickey-Fuller statistic $\hat{t}_t$ (ADF) are given in the bottom part of Table 8.5.2 in Fuller [10].

Table 3 presents results from testing logarithms of CPIs, ratios of Kuwaiti to foreign CPIs (PPP), exchange rates and real exchange rates for unit roots using augmented Dickey-Fuller (ADF) statistics.

Except for Kuwait, it is impossible to reject the hypothesis that the consumer price index has a unit root.[2] If that is true, then, except for Kuwait, the price indexes have no 'nomal' value toward which they tend to return. We also can reject a unit root for only one ratio of consumer price indexes, Kuwait and the United States. Given the pattern for the ratio of consumer price indexes in Figs. 7 and 8, this result may seem surprising. Later in this section we discuss a possible explanation for this result. We cannot reject the null of a unit root for any of the nominal or real exchange rates.

[2] A root less than unity for the Kuwaiti price index is consistent with a stable price index as a goal of the Kuwaiti authorities.

Table 3. Unit root tests: February 1982 to December 1988

Country	CPI	Exchange rate	PPP	Real exchange rate
Germany	− 3.13	− 1.64	− 1.81	− 0.23
Japan	− 2.12	− 1.95	− 3.44	0.27
Kuwait	− 4.46**	NA	NA	NA
United Kingdom	− 2.92	− 1.59	− 3.16	− 0.31
Unites States	− 2.66	− 2.41	− 3.70*	− 0.77
Simulated Data				
No neutral band	NA	− 3.72*	− 2.67	− 4.28**
Neutral band	NA	− 2.31	− 2.56	− 2.61

* Significant at 5 percent level.
** Significant at 1 percent level.

The second step in testing for cointegration is to estimate equation 1 using ordinary least squares and then test the residuals from that equation for a unit root. Table 4 shows the results of cointegration tests between the log of the exchange rates and ratios of consumer price indexes between Kuwait, and Germany, Japan and Great Britain and the United States.

The results in the first column of Table 4, which use exchange rates as the dependent variable in the cointegrating equation, reject cointegration between exchange rates and ratios of price indexes.(3) Tests for cointegration cannot even reject the

Table 4. Tests for cointegration: February 1982 to December 1988

Country	Exchange rate and relative price levels	Price levels
Germany	− 0.88	− 1.74
Japan	− 0.10	− 2.75
United Kingdom	− 1.65	− 3.11
United States	− 1.95	− 2.92
All	NA	− 2.63
Simulated data		
No neutral band	− 3.63*	NA
Neutral band	− 2.31	NA

* Significant at 5 percent level.
** Significant at 1 percent level.

(3) If relative price levels were the dependent variable, then there presumably would have been evidence of cointegration between Kuwait and the United States. But that result would have said nothing about the =

hypothesis that there is no long-run link between exchange rates and relative price levels.

The rejection of a unit root for the ratio of consumer price indexes between Kuwait and the United States, and the apparent link between Kuwaiti and German and Japanese indexes in Figs. 7 and 8, suggests that the Kuwaiti price level may be cointegrated with foreign price levels. The second column in Table 4 explores this possibility. It shows tests for cointegration between Kuwaiti and other consumer price indexes. Even though a unit root is rejected for the Kuwaiti CPI in Table 3 and the Kuwaiti CPI is the dependent variable in the cointegrating equation, none of the statistics are significantly different from zero. It is impossible to reject the null of no cointegration for each pair of indexes.

Officially the Kuwaiti dinar is pegged to a basket of currencies. An attempt to keep the price of that basket stable could introduce a long-run link between the price level in Kuwait and price levels in the basket countries as a group. The row labeled 'all' in column two of Table 4 tests for cointegration between the Kuwaiti consumer price index and all the other indexes as a group. For that test the cointegrating regression regresses the Kuwaiti CPI on the CPI for all of the other countries in Table 4. But again, in spite of the fact of the fact that the Kuwaiti CPI appears to be stationary, there is no evidence of cointegration.

Tests for error correction and cointegration are still relatively new and it is not clear that they are very robust, particularly for samples as small as the 83 monthly observations used here. This concern is reinforced by the fact that a unit root test for the Kuwaiti CPI and for the ratio of Kuwait and U.S. price indexes rejects a unit root, but the presumably more robust test for cointegration between Kuwait and other CPIs cannot reject the null of no cointegration. The next section discusses how transaction costs can bias standard tests of purchasing power against that theory and how the same mechanism might bias tests of cointegration toward accepting the null of no cointegration.

Transaction costs and regression switching

Conventional regression and cointegration tests of purchasing power parity ignore the econometric effects of transaction costs. No one would test the operation of the gold standard by regressing actual exchange rates against mint par. Both the neutral range between gold points and the lack of variability in mint par would make such a test meaningless. But similar problems can arise when testing purchasing power parity.

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long-run link between exchange rates and relative price levels. Regressing a stationary series against a = nonstationary series should yield a statinary error term even if there is no relation between the two series.

Let equation 7 describe the excess demand for foreign exchange from a portfolio balance model like that in Branson [11].

$$Q_t^D = A_0' X_t - A_1 R_t + \mu_t \tag{7}$$

where Q_t^D is the stock of foreign exchange in excess demand, X_t is a vector of appropriate quantities and prices, A_t' is a vector of coefficients, A_0 is a coefficient, and μ_t is an error term.

Equations 8.0 to 8.2 describe the excess supply of foreign exchange from the exchange of commodities where the effects of transaction costs in commodity arbitrage are made explicit.

$$DQ_t^S = B(R_t - P_t - \varepsilon) + D\eta_t \qquad R_t > P_t + \varepsilon \tag{8.0}$$

$$DQ_t^S = B(R_t - P_t + \varepsilon) + D\eta_t \qquad R_t < P_t - \varepsilon \tag{8.1}$$

$$DQ_t^S = \eta_t \qquad R_t + \varepsilon \geq P_t \geq R_t - \varepsilon \tag{8.2}$$

where D is the differential operator, B a coefficent, DQ_t^S the flow excess supply of foreign exchange due to commodity flows and η_t is an error term.

An equilibrium condition completes the model.

$$Q_t^D = Q_t^S \tag{9.0}$$

This model implies regression switching because the appropriate test equation depends on which of the conditions in 8.0 through 8.2 holds. If 8.0 or 8.1 holds, there is a systematic link between exchange rates and relative price levels due to commodity arbitrage. If the condition in 8.2 holds, that link disappears.

The steady state solution for this model, which corresponds to the long run where PPP is supposed to hold, is given by equations 10.0 to 10.2

$$R_t = P_t + \varepsilon \qquad \hat{R}_t > P_t \varepsilon \tag{10.0}$$

$$R_t = P_t - \varepsilon \qquad \hat{R}_t < P_t - \varepsilon \tag{10.1}$$

$$R_t = X_t (A_0 / A_1) + (\mu_t - \eta_t)/A_t \qquad \hat{R}_t + \varepsilon \geq P_t \geq \hat{R}_t - \varepsilon \tag{10.2}$$

where $\hat{R}_t$ is the exchange rate in the absence of commodity arbitrage.

Equations 10.0 to 10.2 are a formal way of stating equation 1 when there are transaction costs. If exchange rates in the absence of commodity arbitrage more than

cover transaction costs, in the long run the exchange rate is the rate implied by PPP plus or minus those costs. If that condition is not met, there is no direct relation between exchange rates and relative price levels through commodity arbitrage. As a result, even in the long run where purchasing power parity holds, estimates of α and β equation 1 are inconsistent because they depend on the conditions in equations 8.0 and 8.2

The impact solution for the model corresponds to an asset model of the short-run determination of exchange rates.

$$R_t = X_t (A_0/A_1) + (\mu_t - \eta_t)/A_1 \tag{11}$$

In the short run, asset market equilibria rather than trade flows determine exchange rates.

The following simulation illustrates the effects of transaction costs. We create an error correction model with and without a neutral band. In order to reflect the situation in Kuwait a little better, in this model the error correction process puts pressure on both exchange rates and relative price levels to return to a long-run target value T. In the simulation, T equals 100.

Equations 2′ and 3′ describe the error correction processes.

$$\Delta R_t = -\lambda(R_t - T) + n_t \tag{2′}$$

$$\Delta R_t = -\lambda(R_t - T) + u_t \tag{3′}$$

where n_t and u_t are uncorrelated random variables. The variance of n_t is about ten times that of u_t, which reflects the difference in the variance of exchange rates and relative price levels. Equation 4′ describes the behavior of real exchange rates in this model.

$$\Delta(R_t - P_t) = -\lambda(R_{t-1} - P_{t-1}) + n_t - u_t \tag{4′}$$

Real exchange rates are a stationary stochastic process, which implies that exchange rates and relative price levels tend to converge in the long run.

The random shocks n_t and u_t are the same in both simulations. The only difference is that in the second simulation there is a neutral band of plus or minus five percent around T where the error correction parameter λ is zero rather than 0.4. Figures 14A and 14B show the simulated data with and without the neutral band.

If the error correction process described in equations 2′ and 3′ operates only outside, but not within, the neutral band there still is an error correction mechanism

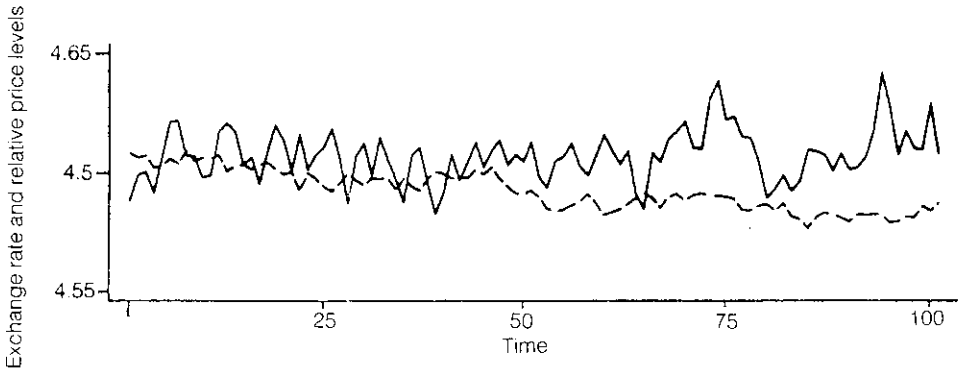

Fig. 14A. Simulated series: no neutral band

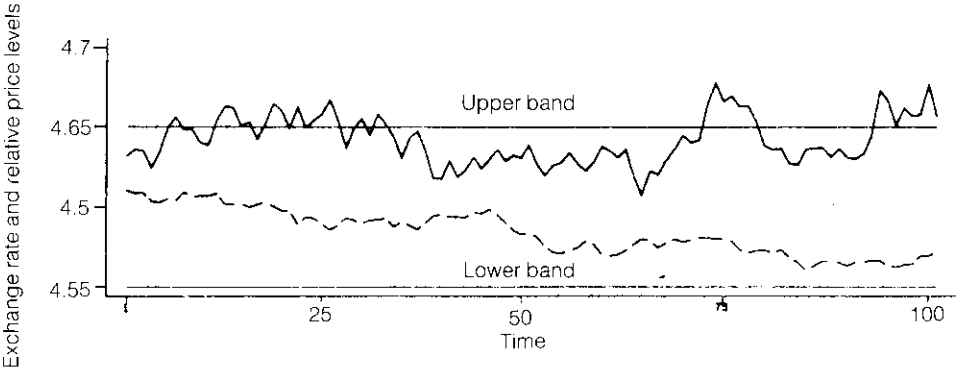

Fig. 14B. Simulated series: neutral band

that keeps exchange rates and relative price levels from drifting apart in the long run. But standard regression tests are likely to reject purchasing power parity in both cases and tests for error correction are biased toward rejection when there is a neutral band.

The bottom part of Table 2 shows the results of regressing simulated exchange rates against simulated relative price levels. Both with and without the neutral band, the regression coefficient is not statistically different from zero. There is no evidence of any link between simulated exchange rates and simulated relative prive levels.

This result illustrates the need to test explicitly for a long-run link between exchange rates and relative price levels. Testing for a unit root in the real exchange rate $R_t - P_t$ in Table 3 reveals some evidence of the long-run link. For the model without a neutral band, the ADF statistic is significant at the 1 percent level. But the existence of a neutral band eliminates the significance. With a neutral band of only plus or minus 5 percent, simulated real exchange rates appear to be martingales.

The results from cointegration tests in Table 4 are even less encouraging. Even though the simulated exchange rate without a neutral band appears to be stationary in Table 3, the test for cointegration in Table 4 is significant at only the 5 percent level. With a neutral band, there is no evidence of cointegration.

Standard interpretations of purchasing power parity suggest an error correction process. In the short run, shocks drive actual rates away from the rates implied by purchasing power parity, but in the long run arbitrage tends to restore equality between actual and parity rates. If this interpretation is correct, then standard regression tests of purchasing power parity can fail to detect the long-run relationship between actual rates and those implied by purchasing power parity. The natural way to respond to this failure of standard regression techniques is to test for unit roots in real exchange rates and for cointegration between exchange rates and relative price indexes. But if transaction costs generate a neutral range within which the error correction does not operate, then these tests are likely to be biased against purchasing power parity.

Summary and Conclusions

The Kuwaiti authorities appear committed to a stable value for the dinar both domestically and internationaly. The major result of their attempt to achieve these potentially conflicting goals appears to be the stabilization of the real dinar price of the U.S. dollar. Whether or not this is a conscious goal or simply the result of their efforts to reach other goals is unclear. Our results suggest the following conclusions: Although the Kuwaiti price index, unlike the other price indexes, is stationary, the authorities have not tried to maintain a constant price level in Kuwait. Instead they have accepted or tolerated a rate of inflation that is about the same as in Germany and Japan, which are its least inflationary major trading partners. Although officially the dinar is pegged to an unspecified basket of currencies, apparently the authorities are willing to tolerate substantial long-run movements in the dinar value of important currencies such as German marks and Japanese yen. There is, however, evidence that the central bank keeps dinar prices of dollars within a fairly narrow range and moderates day-to-day fluctuations in dinar prices of dollars.

Whatever may have been the goal of the Central Bank of Kuwait in the foreign exchange market, the most obvious result of its policies has been the stabilization of the dinar price of dollars in *real* terms. As a result of the stability of dinar-dollar rates in real terms, real dinar exchange rates for other currencies essentially reflect their real dollar values.

References

[1] Davutyan, Nurhan and Pippenger, John. "Purchasing Power Parity Did Not Collapse During the 1970s." *American Economic Review*, 75, No. 5 (Dec. 1985), 1151-58.

[2] Davutyan, Nurhan and Pippenger, John. "Testing Purchasing Power Parity." *Economic Reviews*, forthcoming.

[3] Baillie, Richard and Selover, David. "Cointegration and Models of Exchange Rate Determination." *International Journal of Forecasting*. 3, No. 1 (1987), 43-51.

[4] Corbae, Dean and Ouliaris, Sam. "Cointegration and Tests of Purchasing Power Parity." *Review of Economics and Statistics*. 70, No. 3 (Aug. 1988), 508-11.

[5] Enders, Walter. "ARIMA and Cointegration Tests of PPP under Fixed and Flexible Exchange Rate Regimes." *Review of Economics and Statistics*. 70, No. 3 (Aug. 1988), 504-508.

[6] Enders, Walter. "Unit Roots and the Real Exchange Rate before World War I: The Case of Britain and the USA." *J. of Int. Money and Finance*. 8, No. 1 (March 1989), 59-73.

[7] Engle, Robert and Granger, C.W.J. "Co-Integration and Error Correction: Representation, Estimation and Testing." *Econometrica*. 55, No. 2 (March 1987), 251-276.

[8] Engle, Robert and Yoo, Byung Sam. "Forecasting and Testing in Co-Integrated Systems." *J. of Econometrics*. 35 (1987), 143-159.

[9] Dickey, David A. and Fuller, Wayne A. "Distribution of the Estimators for Autoregressive Time Series with a Unit Root." *J. of the American Statistical Association*. 74, No. 366 (June 1979), 427-431.

[10] Fuller, Wayne A. *Introduction to Statistical Times Series*. New York: John Wiley & Sons, 1976.

[11] Branson, William. "Asset Markets and Relative Prices in Exchange Rate Determination. *Socialwissenschaftliche Annalen*. 1, (1977), 69-99.

علاقة مستويات الأسعار بأسعار الصرف: حالة الكويت

جـون بنجر* و يوسـف حسـن محمد**

** أستاذ الاقتصاد، جامعة كاليفورنيا، سانتا باربارا، الولايات المتحدة الأمريكية*

*** أستاذ مساعد، قسم الاقتصاد، جامعة الكويت*

(قدم للنشر في ١٤١٢/٥/١٥هـ وقبل للنشر في ١٤١٢/١٢/٢هـ)

ملخص البحث. من المهمات الرئيسة للسلطات النقدية في الكويت هي الالتزام بالحفاظ على قيمة ثابتة ومستقرة للدينار على الصعيدين المحلي والعالمي. والنتيجة المباشرة لمحاولة تحقيق هذين الهدفين المتعارضين نوعًا ما هو تحقيق استقرار السعر الحقيقي للدينار مقابل الدولار الأمريكي.

وتشـير نتـائـج البحث إلى أن السلطات النقدية لا تحاول الحفاظ على مستوى ثابت للأسعار في الكويت بل تسمح أو تتغاضى عن معدّل تضخم يعادل ذلك السائد في ألمانيا أو اليابان اللتان تتميزان بانخفاض معدّلات التضخم فيها مقارنة مع الدول الأخرى المرتبطة بالكويت تجاريًا.

ومع العلم أن قيمة الدينار رسميًّا تتحدد اعتمادًا على سلة من العملات إلا أن السلطات تتغاضى عن تقلبات كبيرة في قيمة الدينار وتوجد دلائل على أن البنك المركزي يحافظ على سعر الدينار مقابل الدولار ضمن نطاق ضيق كما يخفف التقلبات اليومية في قيمته. وخلاصة القول، إنه بغض النظر عن أهداف البنـك المـركزي المتعلقة بأسواق الصرف الأجنبية، إلا أن النتيجة الرئيسة المستخلصة من تطبيق هذه السياسات تتمركز في تحقيق استقرار القيمة الحقيقية لسعر الدينار الكويتي مقابل الدولار.