

# Kuwait's Consumption in the Presence of Dramatic Economic Events (1973-2003)

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## 1. Introduction

This paper examines the Kuwaiti consumption function during the period 1973-2003, a period containing dramatic events for the Kuwaiti economy. The 1970's contained the Arab oil embargo of 1973/74 and the first oil price shock, the completion of Kuwait's nationalization of oil producing facilities in 1976, the second oil price shock in 1978, the Iranian Revolution in 1979, and the onset of the Iran/Iraq war. The 1980's included increases in crude oil supply by non-OPEC producers of ten (10) million barrels per day, and the collapse of world crude oil prices in 1986. In 1982, Kuwait's unofficial stock market Al Manakh crashed. Kuwaiti investors sustained massive debts (for example, just prior to the Souk Al Manakh collapse, the amount of outstanding post dated checks for trading payments was estimated at three times Kuwait's 1982 GDP).<sup>1</sup> In the 1990's, the most dramatic event for Kuwait was the 1990 Iraq invasion. Over 60% of Kuwait's oil wells were set on fire, communication systems dismantled and all electricity generating equipment destroyed. Production of goods and services came to a virtual standstill. Kuwait's population was estimated to be reduced to approximately 20% of its original size.<sup>2</sup>

This paper examines three decades in which Kuwait experiences a variety of uncommonly dramatic economic and sociological events. The question we are addressing is: "Is consistency in Kuwaiti consumption maintained even in the presence of extreme economic situations?"

Kuwait is a developing country ranked 25<sup>th</sup> in the world for per capita income (\$26,060).<sup>3</sup> It possesses estimated world crude oil reserves of 96 billion barrels (approximately 8% of the world's reserves). Oil revenues represent from 90-95% of export earnings and over 40% of the GDP. Kuwait sets aside 10% of its oil revenues into the "Future Generations Fund". This fund was created with the expressed purpose of maintaining the Kuwaiti population's standard of living after the time when oil revenues expire.<sup>4</sup> Over 88% of the Kuwaitis are employed

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by the government. State benefits to Kuwaiti citizens are generous.<sup>5</sup> These institutional policies should reinforce the common belief that income streams will remain consistent over time. Thus, the government's behavior (Future Generations Fund, guaranteeing government jobs and a generous transfer payment program) should influence consumer spending in a way consistent with the Permanent Income Hypothesis.

## **2. Literature Review**

Our review will focus on the studies specific to Kuwait. We were able to identify two studies on Kuwaiti consumption functions: Al-Qudsi (1984) and Zind (1999). The Al-Qudsi study was based on the 1972-73 family budget survey and the Zind paper looked at income determination in the Gulf Cooperation Council (GCC) member states (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates).

The Al-Qudsi article applied a Generalized Least Squares (GLS) statistical approach to 1972-73 budget survey data and examined Keynesian Model, Kaldor Hypothesis and Friedman Permanent Income Hypothesis approaches. He found that the MPC for property income was less than that for non-property income. The estimates for the MPC varied from 0.30 to 0.79. The estimate for the APC was 0.73. Al-Qudsi maintained his results did not support the Permanent Income Hypothesis.

Zind's main focus was income determination in the GCC member countries. He used a two-stage regression analysis on a pooled cross section – time series (1975-1997) data set for the GCC. Zind's technique obtained demand function parameters and yearly estimates of the marginal propensity to consume and import. The average MPC was 0.3576 and the APC estimate was 0.3598 for the GCC. The derived MPC was used to calculate the multiplier impact on the GCC economies by autonomous variables (e.g., oil export revenues, government services and investment). The relatively small MPC and APC values are consistent with the contentions held by Keynes and Kurihara that wealthy and high-income economies have relatively small values for both APC and MPC (Allen, 1966).

This paper differs from the previous two studies in five ways. First, this study compares the short-run and long run MPC. Al Qudsi only examined long run MPC (the end product of cross sectional analysis). Zind did not discuss the short and long run MPC. However, he did compare the MPC to the APC. This paper also examines the relationship between APC and MPC.

Second, the Al Qudsi study was based on the 1972-73 family budget survey. Zind used pooled cross section – time series two stage regression analysis over the 1975-1997 time period. Our study uses more recent and a slightly longer data series (1973-2003) obtained from the International Monetary Fund (IMF). Third,

this article uses time series analysis. Historically speaking, the cross-section survey analysis evolving to time-series analysis for Kuwait is consistent with the evolution of MPC analysis in other countries (Thomas, 1989). Fourth, Zind's focus was on the GCC and, as such, he did not examine possible structural breaks in the individual countries. This study explicitly looks at possible structural changes in Kuwaiti consumption behavior. Finally, this article uses advanced econometric techniques (e.g. unit root and cointegration analysis) unavailable to the Al Qudsi study and not used in the Zind paper.

The examination of the Kuwaiti consumption starts by addressing the traditional approaches. The theoretical background of the consumption function is well known and we will not provide an exhaustive review here<sup>6</sup>. Data limitations were such that some of the more sophisticated approaches were not possible<sup>7</sup>. This paper follows the classic route used by Modigliani and Tarantelli (1975) and explicitly starts with the equations expressed in their article. The Elementary Keynesian, Duesenberry-Modigliani (1949) and Brown-Davis-Friedman (1957) models are analyzed. Historically, the empirical consumption function was tested by regressing consumption expenditures on disposable income. The simple Keynesian consumption function known as the Absolute Income Hypothesis (AIH) postulates that real consumption ( $C$ ) is a stable function of real income ( $Y$ ); that is,  $C = f(Y)$  with  $0 < f'(Y) < 1$ , where  $f'(Y)$  is the MPC. The average propensity to consume ( $APC = C/Y$ ) is greater than the MPC ( $APC > MPC$ ), and as income rises, the proportion devoted to consumption falls, (i.e.  $\partial(APC)/\partial(Y) < 0$ ).

The simple Keynesian consumption function is given by

$$C_t = \alpha + \beta Y_t + \varepsilon_t \quad (1)$$

where  $\beta$  is the slope of the consumption function, (i.e. MPC). Early empirical studies for the period 1929-1940 seemed to support the consumption function specified in equation (1). However, by the late 1940s and early 1950s, specification (1) ran into analytical problems (Spanos, 1989 and Thomas, 1989). The first occurred when equation (1) was used to predict the post-WWII period. Consumption was systematically under-predicted and saving over-predicted. This implied that  $C$  was not a stable function of  $Y$  (Davis, 1952). A second problem was Kuznets's (1946) empirical finding that the APC was constant over the long-run (contrary to the hypothesized  $\frac{\partial(APC)}{\partial(Y)} < 0$ ). Consequently, the simple

Keynesian consumption function was questioned and new theories were developed in form of the relative income hypothesis (RIH) of Duesenberry - Modigliani (1949),

$$C_t = \alpha + \beta Y_t + \psi Y_{t-1} + \varepsilon_t \quad (2)$$

and the permanent income hypothesis (PIH) of Brown, Davis and Friedman (1957).

$$C_t = \alpha + \beta Y_t + \theta C_{t-1} + \varepsilon_t \quad (3)$$

The RIH maintains that relative income (current income relative to previous income,  $Y_{t-1}$ ) is important in determining current consumption. The PIH is based on intertemporal consumption theory and maintains that households base their current consumption on their expected lifetime incomes and wealth. The PIH maintains that households spend a fixed fraction of their permanent income on consumption, i.e.  $C_t = \beta Y_t^p$ , where  $\beta$  is the MPC out of permanent income ( $Y_t^p$ ). According to the PIH  $\beta$  is constant and equal to the APC, which is consistent with Kuznets's empirical findings.

### 3. Methodology

Typically, equation (1) was estimated using standard OLS methods. From a statistical standpoint, in order for these results to be reliable, the macroeconomic variables need to be stationary. However, the new developments in econometric analysis (unit root testing and cointegration) have shown that most macroeconomic variables are non-stationary. If the variables are non-stationary, the results of the OLS estimates will be spurious, (i.e. nonsense regression estimates). Consequently, the parameter estimates are not statistically reliable and no conclusions can be made about the coefficients. Therefore, it is necessary to test for stationarity when dealing with time-series data.

The most commonly used unit root test is the Augmented-Dickey Fuller (ADF) test. However, it is now widely accepted that the ADF tests have low power and size distortion and the null hypothesis of a unit root for many aggregate time series data cannot be rejected unless there is strong evidence against it (DeJong et al., 1992; Shiller and Perron, 1985). This test can not distinguish between highly persistent processes and nonstationary processes. For increased power against highly persistent processes, unit root tests that have better size and power properties have been proposed by Elliott et al. (1996) and Ng and Perron (2001). The Augmented-Dickey Fuller -Generalized Least Squares (ADF-GLS) test proposed by Elliott et al., is similar to the ADF test but can achieve significant power gains (against local alternatives) over standard ADF unit root tests.<sup>8</sup>

Perron (1989) argued that most macroeconomic variables are not unit root processes; rather, they are trend stationary processes with structural breaks. Therefore, if a series contains a structural break, standard unit root tests will fail to reject the null of a unit root when, in fact, the null hypothesis is false.

Figure 1 shows Kuwaiti consumption and real GDP in millions of Kuwaiti dinar over the period 1973-2003. Figure 2 show the same relationship but in

logarithmic form. These graphs indicate that a possibility of structural breaks in the data may exist. As a proxy for public spending, figures 3 and 4 present plots for government consumption expenditure both in levels (in millions of Kuwaiti dinar) and logarithmic form for the same period.<sup>9</sup> Figures 1 and 2 indicate the volatile behavior of Kuwait's income especially in the 1970s, 80s, and early 90s. This behavior can be explained by the erratic behavior of oil production and oil exports shown in figures 5-7. One interesting point in the graphs 1-7 is the Iraqi invasion in 1990/91. The huge decrease in income, consumption, oil production, and oil exports, and then the corresponding increase in government expenditure is clearly visible in the graphs. As indicated earlier, the most dramatic event for Kuwait was the 1990 Iraq invasion. Over 60% of Kuwait's oil wells were set on fire, communication systems dismantled and all electricity generating equipment destroyed. Production of goods and services came to a virtual standstill. Kuwait's population was estimated to be reduced to approximately 20% of its original size.

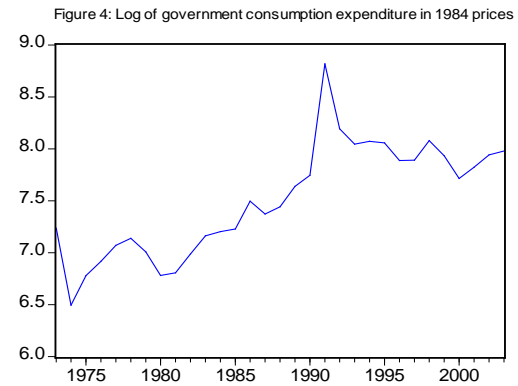
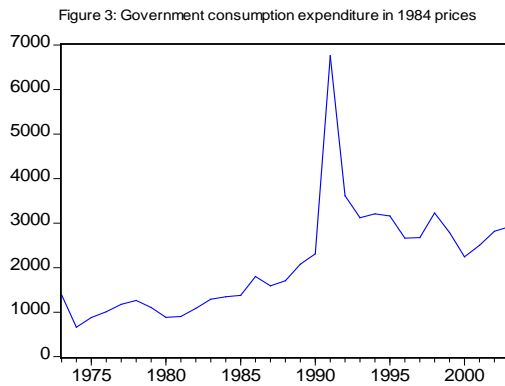
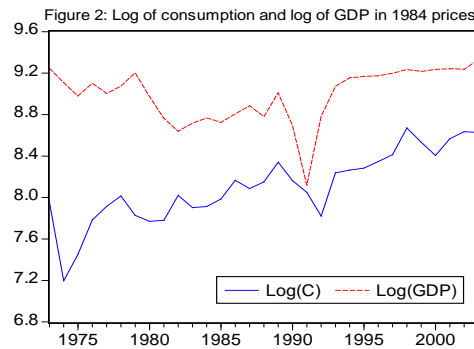
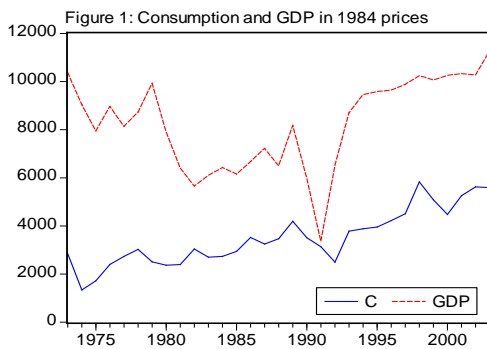


Figure 5: Oil production (index)

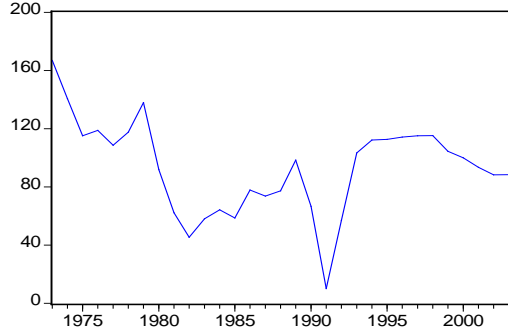


Figure 6: Oil export in millions of Kuwaiti dinar in 1984 prices

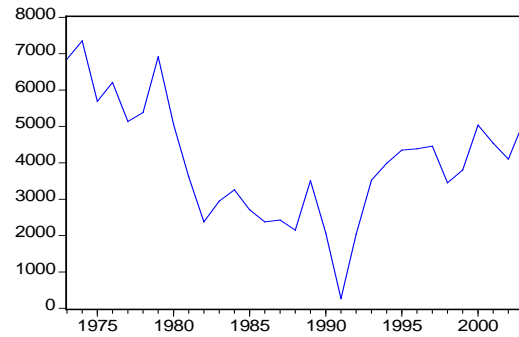
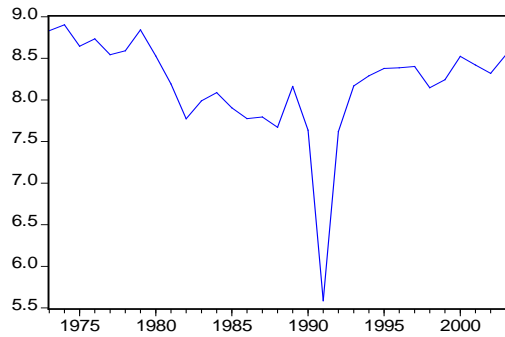


Figure 7: Log of oil export in 1984 prices



This paper makes use of the ADF-GLS test to test for unit roots, and the Zivot and Andrews (1992) test. The Zivot and Andrews (ZA) test allows for the possibility of structural breaks. As the period under consideration (1973 – 2003) is known to contain unusual and dramatic events, the ability to test for and incorporate structural breaks was considered important. After testing the variables for a unit root, the paper tested for cointegration between consumption and income using the standard procedure proposed by Engle and Granger (1987). The procedure was then extended to allow for possible breaks over the sample period 1973-2003.

### 3.1. Unit Root Tests

The ADF-GLS test employed the following model

$$\Delta y_t^d = \alpha + \rho y_{t-1}^d + \sum_{i=1}^k \delta_i \Delta y_{t-i}^d + \varepsilon_t \quad (4)$$

Where  $y_t^d$  is the GLS demeaned real income or consumption at time  $t$  and  $k$  is the number of lags chosen by minimizing the modified Akaike information criterion (MAIC) and.<sup>10</sup> Ng and Perron (2001) show that the MAIC along with the ADF-GLS test produces tests with desirable size and power properties. The MAIC was designed to select a relatively long lag length in the presence of a

moving-average root close to unity and shorter lag length when such a root is not present. The null hypothesis of a unit root is  $\rho = 0$  against the alternative  $\rho < 0$ . The critical values for the test are provided by Elliot et al. (1996).

To account for the possibility of structural breaks, the ZA unit root test is applied to the variables. Zivot and Andrews (1992) propose three models for unit root tests that allow for a one-time endogenously determined structural break in the intercept, or the slope, or both. Model A allows for a one-time change in the mean of the series. Model B allows for a one-time change in the slope of the trend function, and Model C allows for a one-time change in both the mean and the slope of the trend function.

$$\text{Model A: } y_t = \alpha^A + \beta^A t + \rho^A y_{t-1} + \theta^A DU_t + \sum_{i=1}^k \omega_i^A \Delta y_{t-i} + \varepsilon_t^A \quad (5)$$

$$\text{Model B: } y_t = \alpha^B + \beta^B t + \rho^B y_{t-1} + \theta^B DT_t + \sum_{i=1}^k \omega_i^B \Delta y_{t-i} + \varepsilon_t^B \quad (6)$$

$$\text{Model C: } y_t = \alpha^C + \beta^C t + \rho^C y_{t-1} + \phi^C DU_t + \theta^C DT_t + \sum_{i=1}^k \omega_i^C \Delta y_{t-i} + \varepsilon_t^C \quad (7)$$

$DU_t = 1$  if  $t = T_B + 1$ , 0 otherwise,  $DT_t = 1$  if  $t > T_B$ , and 0 otherwise. Where  $T_B$  is the time of the break (which is unknown),  $k$  is the number of lags selected by general-to-specific (GTS) method with  $k_{\max} = 4$ .<sup>11</sup> The GTS method involves setting  $k_{\max}$  and then testing backward the last included lag at the chosen level of significance using normal critical values. Following Zivot and Perron, the insignificant lags are deleted using the 10 percent significance level. The null hypothesis under each model is a unit root ( $H_0 : \rho = 1$ ) with a change in either the level, or the trend, or both, and the alternative hypothesis is trend stationarity with a one-time change in either the intercept, or the slope, or both.

### 3.2. Cointegration Tests

The concept of cointegration involves the existence of a long-run, or equilibrium relationship to which a system converges over time. This implies systematic co-movements among economic variables. If the variables are not cointegrated, they will tend to drift apart over time. To test for cointegration, the residual-based procedure proposed by Engle and Granger (1987) is commonly used because it is easily implemented. In addition, in a two-variable model, such as income and consumption used in this paper, the more general multivariate Johansen (1988) procedure does not produce any additional information, such as determining the number of cointegrating vectors. The Engle and Granger procedure is based on testing the stationarity of the residuals obtained from equations (1) - (3) using the following specification:

$$\Delta \hat{\varepsilon}_t = \vartheta \hat{\varepsilon}_{t-1} + \sum_{j=1}^k \omega_j \Delta \hat{\varepsilon}_{t-j} + v_t \quad (8)$$

Where  $\hat{\varepsilon}_t$  are the estimated residuals and  $v_t$  is distributed normally with independent errors that have a mean of zero and a variance equal to  $\sigma^2$  ( $v_t \sim iid(0, \sigma^2)$ ). The null hypothesis is that the residuals are non-stationary (i.e.,  $H_0: \vartheta = 0$ ), against the alternative of stationarity (i.e.  $H_1: \vartheta < 0$ ). If the residuals are stationary, the variables are said to be cointegrated.

### 3.3. The Data

The paper employs annual data from 1973 to 2003 obtained from the IMF's International Financial Statistics (CD-ROM, June 2005) and contains personal consumption expenditures (line 96F), GDP (line 99B), and the GDP deflator (line 99BIPZF) (1984=100). Real consumption expenditures and real GDP are calculated using 1984 prices. The IMF data base was used because it was a consistent database throughout the period. Moreover, the IMF database was constructed in cooperation with the Kuwaiti Ministry of Planning and Statistics and contained the latest approved revisions (IMF 2005).

## 4. Empirical Results

### 4.1. Preliminary Results

Figure 8 shows a scatter diagram plot for consumption against GDP in 1984 prices. The points around the line have a correlation coefficient of only 0.52. The stability of the MPC is illustrated by examining the recursive MPC estimates. Figure 4 indicates that the MPC has not been stable over time. The 1970's was a period of rising oil prices (income) and the nationalization of the oil industry. The 1980 and 1990's saw two destructive events, the Al Manakh stock market collapse and the Iraqi invasion. These two events strongly (and negatively) affected the amount of accumulated wealth of the Kuwaiti citizenry. While changes to the MPC are explainable using standard economic theory, it does pose analytical problems. Figure 9 shows a declining MPC at the beginning of the data series until the end of the 1980s, and then a rising MPC to the end of the series. This behavior is consistent with nonstationary series. If the series is nonstationary the estimates of the OLS are not meaningful - unless the two variables are



cointegrated.

Figure 8: Consumption against GDP in 1984 prices

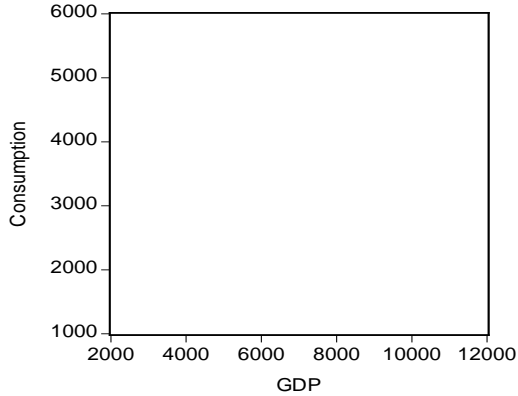
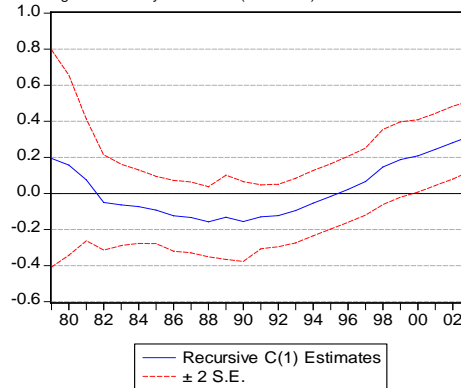


Figure 9: Stability of the MPC (1973-2003)



#### 4.2. Unit Root Tests

Table 1 provides the results of the unit root tests. The ADF-GLS test indicates that real consumption and real GDP are stationary in their first differences and non-stationary in their levels; thus, they are  $I(1)$  processes. The Zivot-Andrews test indicates significant breaks in the slope, intercept, or both for consumption and income around the First Gulf war in 1991 and in 1978/79 second oil price shock.

The results indicate that there are significant breaks in the series and thus, any cointegration test must take these breaks into account. Gregory et al. (1994) has shown that conventional cointegration tests that do not consider structural breaks are biased towards accepting the null of no-cointegration in the presence of structural breaks.

Table 1: unit root tests

ADF-GLS test	Level		First difference			
	$ADF - GLS_{CT}$	$ADF - GLS_C$	$ADF - GLS_C$			
$Y$	-1.25(2)	-1.01(2)	-4.45(1)*			
$C$	-3.41(1)**	-1.17(1)	-2.50(1)**			
$y$	-1.53(2)	-1.28(2)	-5.36(0)*			
$c$	-4.55(0)*	-1.46(0)	-0.85(4)			
Zivot-Andrews test	Model A	BD	Model B	BD	Model C	BD
$Y$	-2.33(4)	1994	-3.10(4)	1991	-2.96(4)	1990
$C$	-5.13(0)**	1998	-4.92(0)**	1993	-5.74(0)*	1991
$y$	-4.25(0)	1993	-3.67(0)	1991	-4.82(0)	1993
$c$	-6.03(0)*	1991	-6.13(0)*	1978	-6.82(0)*	1979

$Y$  and  $C$  are real GDP and real consumption and  $y$  and  $c$  are their natural logarithms, respectively. \*, \*\*, \*\*\* indicate rejection of the null hypothesis of a unit root at the 1%, 5%, and 10% significance levels. The 1%, 5%, and 10% critical values are -5.34, -4.80, and -4.58 for Model A, -4.93, -4.42, and -4.11 for Model B, -5.57, -5.08, and -4.82 for Model C (source: Zivot and Andrews, 1992).

### 4.3. Cointegration Tests

The results of the EG cointegration procedure are provided in Table 2 and indicate that the null hypothesis of no-cointegration can not be rejected for the simple Keynesian consumption function (i.e., Equation (1) in Table 2).<sup>12</sup> The Durbin-Watson statistic is very low (0.41) indicating significant positive autocorrelation. A positive autocorrelation implies that the estimates are not efficient and the estimated variances of the OLS coefficients are biased.<sup>13</sup>

To address the inefficiency and bias problem, an omitted variables test was performed on lagged income and lagged consumption (see Appendix A). The results indicated that lagged consumption makes a significant contribution to the model but not lagged income. Equations (2) – (5) in table 2 show the results of estimating the OLS model with lagged income, lagged consumption, and both. In equation (2) lagged income is not statistically significant, the Durbin-Watson statistic is very low (0.43) indicating significant positive autocorrelation, and the ADF test on the residuals indicates that the variables are not cointegrated. With lagged consumption being added to equation (1), the results in equation (3) show a significant improvement in  $R^2$  (0.75) and the ADF test indicates evidence of cointegration at the 1 percent significance level. The Breusch-Godfrey serial correlation test (LM test) indicates no evidence of serial correlation. However, the MPC is only 0.10 and statistically insignificant.

Table 2: Cointegration results

Equation	constant	$Y_t$	$Y_{t-1}$	$C_{t-1}$	$R^2$	$D.W.$	$LM$ test	$S.E.$	$F$	$ADF$
(1)	874.37 (1.16)	0.32 (3.25)			0.27	0.41	18.26 †	1003.6	10.5	-1.95(0)
(2)	725.60 (0.91)	0.36 (2.17)	-0.02 (-0.13)		0.31	0.43	14.26 †	1004.8	6.10	-2.88(0)
(3)	-95.11 (-0.25)	0.10 (1.67)		0.82 (7.70)	0.75	1.87	0.40	604	40.7	-7.11(0)*
(4)		0.09 (1.91)		0.81 (8.15)	0.75	1.85	0.30	593.5	---	-6.96(0)*
(5)	107 (0.19)	0.18 (2.01)	-0.11 (-0.81)	0.83 (7.91)	0.76	2.07	1.38	600.6	27.9	-7.44(0)*

Notes: in each equation total consumption is regressed on real GDP. Both consumption and GDP are in 1984 prices.  $D.W.$  is Durbin-Watson statistic,  $S.E.$  is the standard error of the regression,  $F$  is the F-statistic, and  $ADF$  is the Augmented-Dickey Fuller test on the residuals in each regression equation.  $t$ -values are in parentheses. \* and \*\* indicate significance at the 1 percent and 5 percent significance levels using MacKinnon (1991) critical values. LM test is the Breusch-Godfrey serial correlation LM test with † indicating rejection of the null hypothesis of no serial correlation.

Given the history of the period, it was reasonable to question whether the income-consumption relationship may have experienced structural breaks in the 1970s and early 1980s and in 1991/92. To account for this possibility three dummy variables are added to equation (1)

$$C_t = \alpha + \beta Y_t + \phi_0 D70s + \phi_1 D91 + \phi_2 D92 + \varepsilon_t \quad (1')$$

Where  $D70s=1$  in 1973 to 1980 and 0 otherwise,  $D91=1$  in 1991 and 0 otherwise, and  $D92=1$  in 1992 and 0 otherwise. The coefficient  $\phi_i$  (for  $i=0,1,2$ ) attached to the dummy variables can be called the differential intercept coefficient because they indicate how much the post-break intercept coefficient differs from the intercept coefficient before the break date.

Prior to estimating (1'), the omitted variables test was performed on the dummy variables individually and jointly. The results indicated that they jointly contribute significantly to the model, but individually only  $D70s$  was found to contribute significantly to the model (see Appendix A). Equation (6) in table 3 shows the results of estimating equation (1') and indicate that all the coefficients are highly significant except the intercept. The overall goodness of fit ( $R^2$ ) is 0.82, and the LM test shows no evidence of serial correlation.

Table 3: Cointegration results with dummy variables

Equation	constant	$Y_t$	$Y_{t-1}$	$C_{t-1}$	$D70s$	$D91$	$D92$	$R^2$	$D.W.$	$LM$ test	$S.E.$	$F$ test	$ADF$
(6)	158.17 (0.35)	0.46 (8.26)			-1882.8 (-7.38)	1428 (5.24)	-662.9 (-5.08)	0.82	1.59	1.31	523.9	29.9	-4.41(0)*
(7)	8.65 (0.02)	0.42 (4.08)	0.05 (0.48)		-1884.8 (-6.68)	1370.5 (3.93)	-463.7 (-1.23)	0.82	1.43	1.07	540.5	22.3	-4.95(0)*
(8)	96.5 (0.24)	0.30 (4.76)		0.36 (3.62)	-1277.9 (-3.38)	744 (2.74)	-711.4 (-6.97)	0.85	1.80	0.06	490.0	28.0	-6.43(0)*
(9)		0.31 (6.50)		0.36 (3.68)	-1276.1 (-3.43)	802.3 (4.11)	-686.7 (-8.96)	0.85	1.82	0.08	481.4	---	-6.42(0)*
(10)	259.2 (0.50)	0.34 (4.46)	-0.08 (-0.72)	0.43 (3.27)	-1127.3 (-2.80)	745 (2.51)	-1014.7 (-2.30)	0.86	1.94	0.52	496.1	22.9	-6.69(0)*
(11)	-67.39 (-0.16)	0.32 (4.88)		0.35 (3.52)	-1268.9 (-3.40)	875 (2.96)		0.84	1.85	0.12	499.8	33.3	-6.43(0)*

Notes: in each equation total consumption is regressed on real GDP. Both consumption and GDP are in 1984 prices.  $D70s$ ,  $D91$  and  $D92$  are dummy variables.  $D70s = 1$  for 1973 to 1980 and zero otherwise,  $D91 = 1$  in 1991 and zero otherwise, and  $D92 = 1$  in 1992 and zero otherwise.  $D.W.$  is Durbin-Watson statistic,  $S.E.$  is the standard error of the regression,  $F$  is the F-statistic, and  $ADF$  is the Augmented-Dickey Fuller test on the residuals in each regression equation.  $t$ -values are in parentheses. \* and \*\* indicate significance at the 1 percent and 5 percent significance levels using MacKinnon (1991) critical values. LM test is the Breusch-Godfrey serial correlation LM test with † indicating rejection of the null hypothesis of no serial correlation.

The coefficients on the dummy variables are statistically different from zero with negative signs on  $\phi_0$  and  $\phi_2$  and a positive sign on  $\phi_1$ . The negative sign on  $\phi_0$  is attributed to the increased levels of uncertainty in the 1970's. Uncertain world response to OPEC cartel action and nationalization of the petroleum sector, the Iranian revolution and the precursors of the Iraq/Iran War (1980) all could have contributed to the low relative consumption in Kuwait. In table 3,  $D70s$  indicates the marginal propensity to consume in the 1973-1979 time period was substantially different (less) from the 1980's and 1990's.

Consumption in both the 1980's (Al Manakh stock market crash) and 1990's (Iraq invasion) was heavily influenced by the overall reduction in the Kuwaiti citizen's wealth. Economic theory would indicate that there exists an inverse relationship between wealth and consumption. That is, as wealth falls, consumption would be expected to increase. Consequently, the 1980-1990 spending patterns would be different (higher) after the 1970's time period.

The positive sign of  $\phi_1$  represents the impact of the massive spending increase immediately following the expulsion of the Iraq troops. Significant cash out of

foreign investments and a \$5.5 billion foreign commercial loan contributed to this spending outlier. The coefficient of  $D92.\phi_2$ , being negative is effected by a rebound effect and the onset of the repayment of debt.

Kuwait recovered from the invasion with remarkable speed. By the end of 1992, crude oil production exceeded pre-invasion levels, and GDP in 1993 was greater than 1989.<sup>14</sup> Post 1993, Kuwaiti 1990's consumption patterns were consistent with those of the 1980's. Kuwaiti consumption was surprisingly relatively stable over these two decades, even in the presence of two major economic disruptions. We suggest that the Kuwaiti authorities were sufficiently well endowed with resources that the governmental authorities could utilize for the financial recovery of the lost wealth due to the stock market crash and rebuild the post-invasion social infrastructure, while at the same time providing public employment and transfer payments to the Kuwaiti citizenry. Kuwait is an oil rich country and recognized as a welfare state. It sets aside 10% of its oil revenues into the Future Generations Fund to maintain the Kuwaiti population's standard of living after the time when oil reserves expire, and over 88% of the Kuwaiti population is employed by the government. In addition, Kuwait provides generous benefits to its citizens (see footnote 5). These government's policies should influence consumer's behavior on the permanent nature of their income. These actions were such, that the consumption patterns of the Kuwaiti population are not significantly adversely affected by major economic events.

Table 3 presents the cointegration results and the estimate of the MPC. The EG procedure indicates that the residuals from equation (1') are stationary at the 1 percent significance level. This implies that real consumption and real income are cointegrated with an estimated value for the MPC of 0.46 (equation (6) in table 3). Equations (7) – (11) include lagged income, lagged consumption, and both. In all of the specifications the results indicate that: a) the variables are cointegrated at the 1 percent level, b) no evidence of serial correlation in the residuals, and c) lagged income is not statistically significant.

As a final specification for the consumption function, equation (8) in table 3 with current consumption regressed on current income, lagged consumption and the three dummy variables seems to be a good candidate. All the coefficients are statistically significant, the variables are cointegrated, the LM test indicates no evidence of serial correlation in the residuals, and the overall goodness of fit is 0.85. The short-run MPC for this specification is only 0.30. That would be puzzling for a rich country such as Kuwait, over a time period without the turmoil. However, given the events in the time period examined (and commonly accepted risk avoidance consumption patterns during adverse situation) a short run MPC of 0.30 could be understandable; as citizens increase their savings in the face of an uncertain future and recover their wealth. Equation 9 supports these

findings as the coefficients are very similar when the intercept term is not included in the equation.

A final issue concerning the specification of the regression model is the form of the model whether it's linear or log-linear.

$$C_t = \alpha + \beta Y_t + \theta C_{t-1} + \phi_0 D70s + \phi_1 D91 + \phi_2 D92 + \varepsilon_t \quad (9)$$

$$c_t = \alpha' + \beta' y_t + \theta' c_{t-1} + \phi_0' D70s + \phi_1' D91 + \phi_2' D92 + \varepsilon_t' \quad (10)$$

Where (9) is the linear model and (10) the log-linear model with  $c_t$ ,  $y_t$  and  $c_{t-1}$  denoting the natural logarithm of consumption, income, and lagged consumption, respectively. The OLS estimates are

$$C_t = 96.26 + 0.30 Y_t + 0.36 C_{t-1} - 1277.9 D70s + 744 D91 - 711.4 D92 \quad (9')$$

(0.24) (4.76) (3.62) (-3.38) (2.74) (-6.97)

$$R^2 = 0.85, \quad D.W. \text{ statistic} = 1.80, \quad \hat{\sigma} = 490.909, \quad LM \text{ test} = 0.06$$

$$c_t = -0.11 + 0.66 y_t + 0.30 c_{t-1} - 0.45 D70s + 0.38 D91 - 0.25 D92 \quad (10')$$

(-0.11) (4.16) (2.00) (-2.48) (2.80) (-7.05)

$$R^2 = 0.80, \quad D.W. \text{ statistic} = 1.35, \quad \hat{\sigma} = 0.1735, \quad LM \text{ test} = 0.25$$

Both specifications indicate no evidence of serial correlation in the residuals as indicated by the LM test, and the ADF test on the residuals indicate that the variables are cointegrated at the 1 percent level. To determine the correct functional form, that is linear or log-linear, we use the sign of  $\lambda$  test, which is a variant of the test proposed by Sargan (1964). The test is calculated as follows

$$\lambda = N \left( \log \left( \frac{\hat{\sigma}_c}{\hat{\sigma}_c'} \right) - \bar{c} \right) \quad (11)$$

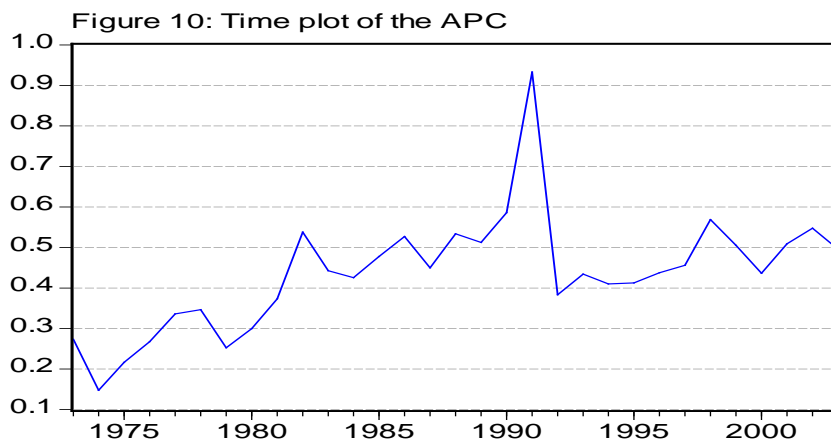
where  $N$  is the number of observations,  $\hat{\sigma}_c$  and  $\hat{\sigma}_c'$  are the standard errors of the regressions (9') and (10'), respectively, and  $\bar{c}$  represents the average of the natural logarithm of consumption. The linear model (9') is preferred if  $\lambda$  is negative, and the log-linear model (10') is preferred if  $\lambda$  is positive. Applying this to the results in (9') and (10') yields

$$\lambda = 31 \left( \log \left( \frac{490.909}{0.1735} \right) - 8.106 \right) = -144.28 < 0$$

Therefore, given  $\lambda$  is negative, the linear model was preferred to the log-linear model.

One important result from the final specification equation (9) is the estimate of the intercept in the consumption function that is not statistically different from zero (implying that MPC = APC). The finding is important because it implies that over the long run the APC is relatively constant.<sup>15</sup> This has policy implications because personal consumption expenditures are generally considered the most

stable component of aggregate demand. If the APC was not stable for a small open-economy such as Kuwait, then consumption expenditures would add to increased variability and this increased variability, along with the more volatile components of aggregate demand such as investment and exports, would make GDP more volatile (Abeyasinghe and Choy, 2004) and contribute to the uncertainty in the economy. The average consumption following 1982 is relatively stable. The long run MPC is 0.47.<sup>16</sup> This estimate is relatively close to the APC of 0.42 for the 1973 – 2003 time period and even closer to the APC (1981-2003) estimate of 0.48. Graphic representation of APC is illustrated in figure 10.



## 5. Summary and Conclusions

The time period examined (1973-2003) represents a dramatic period in the history of Kuwait. The question we were concerned about was: “Is the consistency in Kuwaiti consumption maintained in the presence of extreme economic situations.” The answer we received was mixed.

The Kuwaiti consumption function was found to structurally change from its low 1970’s levels and increase in value during the 1980’s and 1990’s. However, the MPC was found to be surprisingly consistent for the last two decades. The short-run MPC was found to be only 0.30. Given the events in the time period examined, a short run MPC of 0.30 can be explained as citizens increase their savings to recover from the stock market crash in the 1980’s and the Iraq invasion in the 1990. The long-run MPC was 0.47.

Kuwait is an oil rich country and recognized as a welfare state. The government’s behavior should influence consumer’s opinion on the permanent nature of their income. In this situation one would expect the MPC to approach

the APC. MPC approaching APC is supported by the empirical findings. The intercept was consistently not significantly different from zero (and when excluded, test results were not significantly altered). These findings are consistent with the Permanent Income Hypothesis. Moreover, Kuwait consumptive behavior remained surprisingly relatively consistent over the past two decades.

We suggest that the Kuwaiti authorities were sufficiently well endowed with resources that the governmental authorities could utilize for the financial recovery of the lost wealth due to the stock market crash and rebuild the post-invasion social infrastructure, while at the same time providing public employment and transfer payments to the Kuwaiti citizenry. These actions were such, that the consumption patterns of the Kuwaiti population are not significantly adversely affected by major economic events.

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**Appendix A: Omitted variables test**

Basically, this test enables us to determine whether adding a variable or a set of variables to the regression model makes a significant contribution to the model. The test is an F-statistic based on the difference between the residuals sum of squares of the restricted and unrestricted regression models ( $RSS_R$  and  $RSS_U$ ). The null hypothesis is that the additional variables are not jointly significant.

Table A1: Omitted variable test for variables reported in table 2.

Equation	constant	$Y_t$	$Y_{t-1}$	$C_{t-1}$	$F$ - stat.	$LR$ test
(1)	874.37 (1.16)	0.32 (3.25)				
(2)	725.60 (0.91)	0.36 (2.17)	-0.02 (-0.13)		0.016 (0.899)	0.018 (0.892)
(3)	-95.11 (-0.25)	0.10 (1.67)		0.82 (7.70)	47.781 (0.000)*	30.562 (0.000)*
(4)		0.09 (1.91)		0.81 (8.15)	51.384 (0.000)*	31.262 (0.000)*
(5)	107 (0.19)	0.18 (2.01)	-0.11 (-0.81)	0.83 (7.91)	24.804 (0.000)*	31.024 (0.000)*

Notes: the first five columns in the table are the estimates for equations (1) – (5) reported in table 2. The last two columns represent the  $F$  - stat. and  $LR$  test for the omitted variable test with the p-values reported in parentheses. \* and \*\* indicate significance at the 1 percent and 5 percent levels.

Table A2: Omitted variable test for variables reported in table 3.

Equation	constant	$Y_t$	$Y_{t-1}$	$C_{t-1}$	$D70s$	$D91$	$D92$	$F$ - stat.	$LR$ test
(6)	158.17 (0.35)	0.46 (8.26)			- 1882.8 (-7.38)	1428 (5.24)	-662.9 (-5.08)	26.801 (0.000)*	43.684 (0.000)*
(6')	635.01 (1.05)	0.41 (5.66)			- 1869.6 (-7.67)			60.149 (0.000)*	35.552 (0.000)*
(6'')	216.89 (0.29)	0.39 (3.96)				1602.01 (3.64)		1.957 (0.173)	2.095 (0.148)
(6''')	954.74 (1.24)	0.31 (3.13)					- 480.27 (-2.36)	0.209 (0.651)	0.231 (0.631)
(7)	8.65 (0.02)	0.42 (4.08)	0.05 (0.48)		- 1884.8 (-6.68)	1370.5 (3.93)	-463.7 (-1.23)	17.342 (0.000)*	40.754 (0.000)*
(8)	96.5 (0.24)	0.30 (4.76)		0.36 (3.62)	- 1277.9 (-3.38)	744 (2.74)	-711.4 (-6.97)	22.297 (0.000)*	46.530 (0.000)*
(9)		0.31 (6.50)		0.36 (3.68)	- 1276.1 (-3.43)	802.3 (4.11)	-686.7 (-8.96)	23.912 (0.000)*	47.221 (0.000)*
(10)	259.2 (0.50)	0.34 (4.46)	-0.08 (-0.72)	0.43 (3.27)	- 1127.3 (-2.80)	745 (2.51)	- 1014.7 (-2.30)	17.569 (0.000)*	47.179 (0.000)*
(11)	-67.39 (-0.16)	0.32 (4.88)		0.35 (3.52)	- 1268.9 (-3.40)	875 (2.96)		28.061 (0.000)*	44.224 (0.000)*

Notes: the first eight columns in the table are the estimates for equations (6) – (11) reported in table 3. The last two columns represent the  $F$  - stat. and  $LR$  test for the omitted variable test with the p-values reported in parentheses. \* and \*\* indicate significance at the 1 percent and 5 percent levels. The omitted variable test for the three dummy variables ( $D70s$ ,  $D91$ , and  $D92$ ) jointly is given in the last two columns in equation (6). The omitted variable test for the individual dummy variables is given in the last two columns in equation (6') for  $D70s$ , equation (6'') for  $D91$ , and equation (6''') for  $D92$ .

Table A3: Zivot-Andrews test

	Model A	BD	Model B	BD	Model C	BD
<i>Y</i>	-4.09(0)	1980	-3.42(0)	1991	-4.52(0)	1993
<i>C</i>	-4.33(5)	1998	-	1997	-5.25(5)**	1992
			4.39(5)***			
<i>y</i>	-4.25(0)	1993	-3.67(0)	1991	-4.82(0)	1993
<i>C</i>	-4.17(5)	1991	-3.28(5)	1995	-5.34(5)**	1992

\*, \*\*, \*\*\* indicate rejection of the null hypothesis of a unit root at the 1%, 5%, and 10% significance levels. The 1%, 5%, and 10% critical values are -5.34, -4.80, and -4.58 for Model A, -4.93, -4.42, and -4.11 for Model B, -5.57, -5.08, and -4.82 for Model C (source: Zivot and Andrews, 1992). The number of lags is selected using GTS method with  $k_{\max} = 8$  at the 10 percent significance level.

<sup>1</sup> IMF (1997) p. 42.

<sup>2</sup> IMF (1997) p. 4.

<sup>3</sup> According to the IMF World Economic Outlook Database, Sept. 2006 – Kuwait ranks 25<sup>th</sup> worldwide with a per capita GDP of \$26,020.

<sup>4</sup> Consequently, there is an exogenous addition to savings or, looked at differently, subsequent reduction in current consumption.

<sup>5</sup> The Kuwaiti government has subsidized extensively from electricity and gasoline to housing, medical care, education based foreign travel and white-collar jobs for 96% of its working citizens (Sadowski, 1997).

<sup>6</sup> For a good discussion on the history of the consumption function please see J.J. Thomas (1989).

<sup>7</sup> There were a number of areas that were of interest but we just did not have the data. For example, durable good information and splits between non-Kuwaiti and Kuwait incomes were not available.

<sup>8</sup> Elliot et al. (1996) show that the asymptotic distribution of ADF-GLS tests is the same as the ADF test.

<sup>9</sup> In our case, using public spending is more appropriate since it includes all types of spending by the government. Due to lack of data, government consumption expenditure (G) from the IMF's national accounts is used as proxy for public spending. G excludes transfer payments, such as social security benefits and subsidies (see footnote 5).

<sup>10</sup> Demeaned is the case in which a series is replaced by the residuals from the regression on a constant.

<sup>11</sup> The choice of  $k_{\max} = 4$  is somewhat arbitrary. While too many lags reduce efficiency, too few imply serial correlation in the residuals thereby invalidating standard significance tests. That being said,  $k_{\max} = 8$  is also used and the results, reported in Appendix 1 in table A3, are not significantly different from those obtained using  $k_{\max} = 4$ . Moreover, using long lag length, such as  $k_{\max} = 8$ , or  $k_{\max} = 12$ , in annual data is economically implausible. To illustrate this point, assume we use the GTS method with  $k_{\max} = 12$ , and the method selects  $k = 10$ , that is, the lag

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length is 10 years. This means that it would take 10 years for the full effect of a shock to income/consumption to be felt, which is, again, economically implausible.

<sup>12</sup> The cointegration procedure proposed by Gregory and Hansen (1996), which allows for a single structural break in the intercept, or the slope, or both, was also utilized and the results were not supportive since the procedure allows for a single break and the series contain more than one break.

<sup>13</sup> Autocorrelation can occur if successive observations are correlated or if the OLS model is misspecified. Misspecification can arise if some important variables are not included in the regression model or if the model has the wrong functional form.

<sup>14</sup> IMF (1997) p. 5

<sup>15</sup> Figure 5 which shows a time plot for the APC in 1984 prices indicates a steady increase in the APC with large fluctuations in 1970s and around 1990/91. However, regressing  $\Delta \log(APC)$  on a constant and time trend indicated statistically insignificant coefficient on the time trend. Another specification with dummy variables being added to the regression model to allow for the rising prices in the 1970s and the invasion and the First Gulf war in 1990/91 resulted with a similar result. All unreported results are available upon request.

<sup>16</sup> The long-run MPC is calculated as  $\frac{0.30}{1 - 0.36}$ .