

## **The Private Consumption Function in Saudi Arabia**

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This paper empirically estimates the critical parameters of private consumption function in Saudi Arabia for the period 1986-2008 by using dynamic ordinary least squares (DOLS) approach of Stock and Watson (1993). The analysis is based on time series from 1986 to 2008. Time series properties of the processes that generate the data be assessed to specify the order of integration for each series to satisfy the conditions of applying the DOLS procedure. The empirical results confirmed that there exists a significant relationship among the real private consumption in Saudi Arabia and both of real income and real interest rate, but an insignificant relationship with financial wealth. Our estimation results show that all variables have its theoretical expected sign (positive for real income and financial wealth, but negative for real interest rate).

*Keywords:* Saudi Arabia, private consumption function, DOLS estimation

### **Introduction**

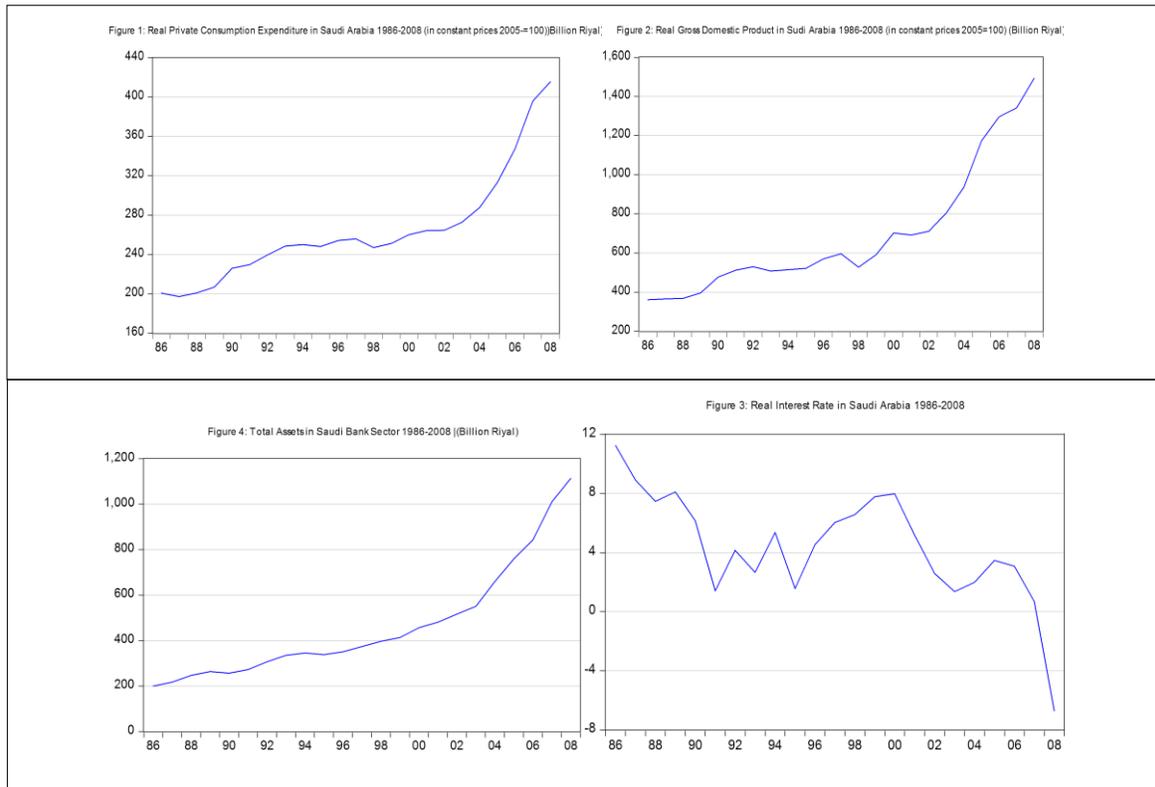
The Private consumption expenditure has been an intensive subject of interest in Saudi Arabia. So, in the recent years, questions were raised about the factors that can affect the Private consumption expenditure in Saudi Economy. This study investigates the factors that determine the private consumption expenditure in Saudi Arabia for the period 1986-2008 by using dynamic ordinary least squares (DOLS) approach of Stock and Watson (1993). This research is significant as it adds to the body of knowledge on the validity of the theories of consumption functions that have been propagated, especially by Keynes, for the case of a developing country like Saudi Arabia.

The paper is structured as follows: Introduction of the paper will be introduced in Section 1. Section 2 provides some stylized facts about Saudi economy and the behavior of consumption expenditure in Saudi Arabia. Section 3 presents the theoretical background on which the models are based and also gives an empirical review of the literature. Section 4 discusses the data, evaluates the specifications of the economic models and describes the econometric methodology that will be adopted. Section 5 reports on the empirical results and Section 6 summarizes the concluding remarks.

### **Stylized Facts about Saudi Economy and the Behavior of Consumption Expenditure**

The Saudi economy recorded high growth in 2012 as global economic recovery lifted up oil prices, and enlarged fiscal spending by the government boosted domestic demand and accelerated the growth in non-oil GDP. On the same line, the actual budget recorded a surplus of SAR 374.09 billion or 14 percent of GDP in 2012 compared by a surplus of SAR 291.09 billion or 11.6 percent of GDP in the previous year. On the other hand, the ratio of public debt to GDP declined from 8.5 percent in 2010 to 3.7 percent in 2012. The current account of the balance of payments recorded a surplus for the fourteenth year consecutively amounting to SAR 617.8 billion or 22.1 percent of GDP in 2012 (Saudi Arabian Monetary Agency (SAMA, 2014).

In this respect, as it shown in table (A-1), there has been a significant increase in real private consumption of 200.76 billion riyals in 1986 to 479.81 riyals in 2011 at constant prices of 2005. Thus, the private the consumption function has been an important subject of empirical and theoretical researches in Saudi Arabia. These researches should highlight the significance of the economic factors that influencing the behavior of private consumption expenditure, such as gross domestic product (GDP), wealth (can be expressed as real total assets of banking sector) and real interest rate.



Source: Table (A-1) in the Appendix.

The Figures 1, 2 and 4 indicate that there are similar directions among real private consumption, real gross domestic product (GDP) and real total assets of banking sector, with the exception of real interest rate in Figure 3, which take different direction.

Table 1 indicates that private consumption expenditure growth rate during 1986-1994 was 2.78 percent and much higher than the growth rate of government consumption which during the same period was only 0.08%. On the contrary, during the period 1995-2003 government consumption growth

rate increased to 6.08%, while the rate of growth of private consumption dropped to 1.19%. During the period 2004-2011, both of private and government consumption has achieved high growth rates about 7.58% and 5%, respectively. The outcome was that during the whole period 1986-2011, both private consumption and government consumption achieved average convergent growth rate of 3.55 and 3.7%, respectively, and the average growth rate of the total consumption during the period was about 3.61%.

Table 1: Consumption expenditure growth rate in Saudi Arabia (1986-2011)

Period	Real Private Consumption Expenditure Growth Rate	Real Government Consumption Expenditure Growth Rate	Real Total Consumption Expenditure Growth Rate
1986-1994	2.78	0.08	1.79
1995-2003	1.19	6.08	3.01
2004-2011	7.58	5.00	6.50
1986-2011	3.55	3.70	3.61

Source: Table (A-2) in the Appendix.

Figure 5 indicate that during the period (1986-2011) real private consumption expenditure has more than

60% of total consumption expenditure , and this ratio hasn't changed along the period.

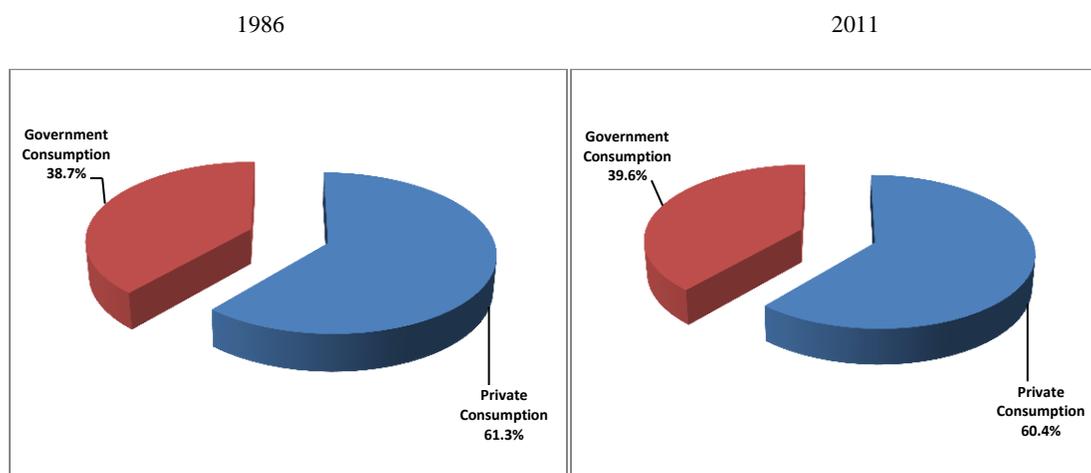


Figure 5: The structure of consumption expenditure 1986-2011. Source: Table (A-2) in the Appendix.

## Literature Review

According to Keynes (1936), if income rises, consumer spending will expand proportionally, but by a fraction of the initial increase in income. He further established that the non-income determinants of consumption are: wealth, credit, taxes, expectations, and aggregate price levels. All of the above explanatory variables relate to the current period and therefore contrasts with the multi-period model of saving (consumption) suggested earlier by Fisher (1930). However, while Keynes' "absolute-income" hypothesis (AIH) differs fundamentally from Fisher's theory, Keynes did utilize some elements of the wealth hypothesis. According to Mayer (1992), Keynes still considered the stock of wealth to have an important effect on consumption. Additionally, Keynes thought the propensity to consume to be much less for transitory income than for permanent income. In the 1940s, the credibility of the AIH was severely challenged by empirical developments as attempts to apply the model over lengthier time frames were not very successful (Romer, 1996). This led to the emergence of a variety of consumption theories including the "relative-income" hypothesis (RIH) developed by Duesenberry (1949). In contrast to Keynes' argument, Duesenberry asserts that present levels of consumption are not only motivated by current levels of permanent income, but also by achieved levels of consumption in preceding periods. This, he laments, is implied from the simple fact that once a level of consumption is attained, it is difficult

to reduce. The marginal propensity to consume (MPC) then is assumed to be dependent on the level of present income relative to past peaked income.

In a subsequent article, Modigliani and Brumberg (1954) proposed that the proportion of lifetime income spent on consumption in any given period further depends on the interest rate, the age of the individual, and the specific form of the multi-period utility function. This formulation was later recognized as the "life-cycle" hypothesis (LCH). Unlike the AIH, which adopts the view that consumption is exclusively based on current income, the LCH assumes that households consume a constant portion of the present value of their lifetime income. The LCH predicts that individuals save while they work in order to finance consumption after retirement. Conversely, White's (1978) assessment of the LCH criticized its conclusions when his analysis revealed that the hypothesis did not fully account for savings.

Succeeding the LCH is Friedman (1957)'s theoretically sound "permanent-income" hypothesis (PIH). Adding to the criticisms of Keynes' AIH, Friedman (1957) posits that empirical studies did not display a consistent, stable relationship between current income and current consumption. He demonstrated that his PIH provided a comprehensive, yet simple explanation for the apparent inconsistencies that were reported by empirical findings. Essentially, Friedman's analysis implies that the individual's consumption in a given period is determined not by the income of that period, but rather by income over his or her entire lifetime, the so

called annuity value of lifetime resources<sup>1</sup>. Both theories of Modigliani and Brumberg (1954) and Friedman (1957) represent a theoretical specification of the empirical implementation of the multi-period theory which originated with Fisher (1930).

In 1963, Friedman extended the treatment of his basic hypothesis to incorporate Cagan (1956)'s adaptive expectations theory and formally showed that current consumption depends not only on current income but also on future income. Friedman's pioneering work was further expanded upon by Hall (1978) who, instead of using adaptive expectation, combined the theory of rational expectations with the PIH to conclude that consumption follows a random walk process. Since Hall's initial attempt to find a satisfactory empirical counterpart of the rational expectation version of Friedman's permanent income hypothesis, other economists have conducted rigorous empirical studies to validate his claim.

Although Hall's "rational expectation permanent income" hypothesis (REPIH) was eventually accepted, results of empirical tests of the hypothesis have been mixed, with the weight of the evidence going seemingly against the hypothesis (Craigwell and Rock, 1992c).

Consumer behavior has been exhaustively investigated in a number of developed countries, particularly for the North American and Eastern areas. On the contrast, consumption function was rarely conducted on developing countries. Avazalipour (2011) focused on Consumption Function between Iran and India as a comparative study. This study showed that although the Iran's MPC and Consumption-GDP ratio were lower than India's during the last three decades, but in the future decades this situation of consumption will change so that Iran's Consumption-GDP ratio will be higher than India's. Sutherland and Craigwell (2011) estimated a consumption function of a monetary union as a single entity. It is also the first empirical consumption research on the Eastern Caribbean Currency Union (ECCU). Due to the open nature of these nations it further adds to the literature by examining open economy variables like the terms of trade and the degree of export orientation. The panel dynamic least squares method employed indicates that private spending is primarily driven by income, financial wealth, the interest rate, terms of trade and the degree of export orientation. On the other side, there is no previous study paying attention to private consumption expenditure for Saudi Arabia or other gulf countries. So this study is trying to fill the gap in this area.

### The model and the methods

The private consumption function is generally specified as follows:

$$PC=f(Y, W, R) \quad (1)$$

where PC is real final private consumption expenditure, Y is real income, W is real accumulated financial wealth and R is real interest rate.

Firstly, the inclusion of the income variable is well justified by the standard consumption theories due to Keynes, Duesenberry and Friedman, discussed above, where it is anticipated that marginal increases in income will have a positive effect on private consumption in Saudi Arabia. Additionally, it is expected that the MPC out of income, will be less than unity. In accordance with the assertions of the basic PIH and LCH, private consumption should also be positively affected by current stocks of financial and physical assets since a marginal augmentation in net wealth is anticipated to allow households to be more inclined to spend and less likely to save at each income level, *ceteris paribus*.

A rise in the real interest rate may reflect a greater opportunity cost of spending presently since an expansion in current saving would afford the household the prospect to consume more in the future. Increases in the present interest rate may therefore provide a motivation to reduce current consumption. Simultaneously, it might no longer be necessary to save as much in order to achieve the same desired level of income in the future due to the income effect of an expansion in the real interest rate. Since it will be now possible to save less and consume more, both in the present and in the future, private spending might actually increase with a rise in interest. Given this theoretical ambiguity, the effect of the interest rate is a subject for empirical analysis.

This paper therefore aims to employ recent developments in co-integration analysis. In addition to the traditional variables of income and wealth, contemporary regressor like the real interest rate may also be important determinant of private consumption expenditure in Saudi Arabia. Given the extent to which such estimates are needed for the purpose of planning national economic development, their precision becomes of crucial importance.

So, This study investigates the relationship between private consumption , real income in Saudi Arabia for the period 1986-2008 by using dynamic ordinary least squares (DOLS) approach of Stock and Watson (1993). The analysis is based on time series from 1986 to 2008. Time series properties of the processes that generate the data will be assessed in order to specify the order of integration for each series to satisfy the conditions of applying the DOLS procedure.

The model that has been estimated is:

$$\log(PC) = \beta_0 + \beta_1 \log(Y) + \beta_2 R + \beta_3 \log(W) + \varepsilon \quad (2)$$

where PC is real final private consumption expenditure, Y is real income, W is real accumulated financial wealth and R is real interest rate. With the exception of the real interest rate, all other variables are in natural logarithmic form. The variable "C" is real final private consumption expenditure, real income "Y" has been expressed by the real gross domestic product, while "W" has been proxied by real financial assets value of Banking sector and finally, real interest rate "R" has been expressed by the nominal interest rate of bank deposits minus inflation rate and " $\varepsilon$ " is the error term.

This study used the annual data from 1986 to 2008 for Saudi Arabia. All data in this study was obtained from Saudi Arabian Monetary Agency (SAMA) and World Bank Development Indicator, the data has been converted to real values (2005 constant

prices) by using consumer price index (2005=100). All these factors are illustrated at Table (A-1) in the appendix.

### Empirical Results

Augmented Dickey- Fuller (ADF) and Phillips and Perron (PP) unit root tests are calculated for individual series to provide evidence as to whether the variables are stationary and integrated of the same order.

The results of both tests for each variable appear in Table 2. The lag parameter in ADF test is selected by Akaike information criterion (AIC) to eliminate the serial correlation in residual (Akaike, 1973). As shown in Table 2, the null hypothesis of a unit root can't be rejected for levels of all variables in the two tests but the null hypothesis is rejected for the first differences of all variables. Therefore, we conclude that the series are integrated of order one.

Table 2: Unit root tests

			ADF	PP
Log(PC)	Level	C	1.402517	2.014836
		C,T	-1.673539	-1.001776
	First Diff.	C	-2.612058	-2.612058
		C,T	-3.367251 <sup>c</sup>	-3.434644 <sup>c</sup>
Log(Y)	Level	C	1.503581	1.955316
		C,T	-1.532147	-1.485434
	First Diff.	C	-3.318330 <sup>b</sup>	-3.256679 <sup>b</sup>
		C,T	-3.679461 <sup>b</sup>	-3.872729 <sup>b</sup>
R	Level	C	-0.826839	-0.810914
		C,T	-1.660596	-1.742280
	First Diff.	C	-4.001732 <sup>a</sup>	-4.001732 <sup>a</sup>
		C,T	-3.883555 <sup>b</sup>	-3.886584 <sup>b</sup>
Log(W)	Level	C	1.156048	0.968302
		C,T	-0.099271	-0.428093
	First Diff.	C	-3.377603 <sup>b</sup>	-3.377603 <sup>b</sup>
		C,T	-3.454267 <sup>c</sup>	-3.454267 <sup>c</sup>

Notes: ADF-Dickey DA, Fuller WA., (1979) unit root test with the Ho: Variables are I (1); PP- Phillips and Perron (1988) unit root test with the Ho: Variables are I (1); a, b and c indicate significance at the 1%, 5% and 10% levels, respectively. (C, T) indicate that the test executed with intercept, trend respectively.

The linear combination of the variables may however be stationary. This claim is being supported by Hansen parameter instability approach in Table 3 , which confirms this claim of long run relationship

among the variables with probability value greater than 0.2 thereby accepting the null hypothesis of existence of cointegrating relationship.

Table 3. Cointegration result of Hansen parameter instability approach

Lc statistic	Trends (m)	Trends (k)	Trends (p2)	Prob.*
0.045402	1	1	0	> 0.2

\*\*Hansen (1992b) Lc(m2=2, k=1) p-values, where m2=m-p2 is the number of stochastic trends in the asymptotic distribution.

Since the variables are cointegrated, they can be represented equivalently in terms of a long run DOLS framework. In Table 4, we see the results of the long run DOLS estimates for equation 2. The explanatory power is high ( $R^2=99$ ). All the explanatory variables are significant at 1% level.

$$\log(PC) = 2.96 + 0.4 \log(Y) - 0.013 R + 0.02 \log(W) + \varepsilon$$

3)

Table 4: DOLS estimates in the long run (1986-2008)

Variable	Coefficient
C	2.96 <sup>a</sup>
LOG(Y)	0.40 <sup>c</sup>
R	- 0.013 <sup>c</sup>
LOG(W)	0.02
	$R^2 = 99$
	Durbin-Watson: 1.49

Source: Table (A-2) in Appendix.

a, b and c indicate significance at the 1%, 5% and 10% levels, respectively.

## Conclusion

This study empirically estimates the critical parameters of private consumption function in Saudi Arabia for the period 1986-2008 by using dynamic ordinary least squares (DOLS) approach of Stock and Watson (1993). The analysis is based on time series from 1986 to 2008. The empirical results confirm that there exists a significant relationship among the real private consumption in Saudi Arabia and both of real income and real interest rate, but an insignificant relationship with financial wealth. Our estimation results show that all variables have its theoretical expected sign (positive for real income and financial wealth, But negative for real interest rate).

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- World Bank, World Bank Development Indicator.

## Appendix (A)

Table (A.1): Economic Data (1986-2008)

Period	Real Private Consumption (PC) (2005=100) (Billion Riyal)	Real Gross Domestic Product (Y) (2005=100) (Billion Riyal)	Real Interest Rate (R) (%)	Real Financial Assets of Bank Sector (W) (2005=100) (Billion Riyal)
1986	200.76	361.62	11.25	199.80
1987	197.21	365.81	8.91	217.58
1988	201.00	368.01	7.47	246.92
1989	206.99	395.94	8.10	264.00
1990	226.02	476.47	6.15	256.93
1991	229.75	511.95	1.40	272.77
1992	239.64	529.78	4.15	307.11
1993	248.60	507.80	2.67	335.40
1994	250.04	514.45	5.37	345.45
1995	248.16	521.54	1.56	338.26
1996	254.18	569.97	4.53	350.63
1997	255.93	596.01	6.04	373.76
1998	247.02	527.24	6.57	397.23
1999	251.19	591.53	7.78	413.53
2000	260.00	702.06	7.98	456.56
2001	264.37	691.78	5.18	481.21
2002	264.63	711.04	2.58	516.49
2003	272.76	804.78	1.36	550.83
2004	287.70	936.45	1.99	659.97
2005	312.96	1172.40	3.47	759.08
2006	347.25	1295.95	3.08	842.49
2007	395.64	1340.98	0.69	1009.90
2008	415.52	1492.63	-6.71	1113.29

Source: Saudi Arabian Monetary Agency (SAMA), *Annual Report*, No. 47. World Bank, *World Bank Development Indicator*.

Table (A-2): Consumption Expenditure in Saudi Arabia (1986-2011)

Period	Real Private Consumption Expenditure (2005=100) (Billion Riyal)	Real Government Consumption Expenditure (2005=100) (Billion Riyal)	Real Total Consumption Expenditure (2005=100) (Billion Riyal)
1986	200.76	126.64	327.40
1987	197.21	130.25	327.46
1988	201.00	116.75	317.75
1989	206.99	135.58	342.57
1990	226.02	141.53	367.54
1991	229.75	178.58	408.33
1992	239.64	161.35	400.99
1993	248.60	136.96	385.56
1994	250.04	127.43	377.47
1995	248.16	124.85	373.01
1996	254.18	141.82	396.00
1997	255.93	158.39	414.33
1998	247.02	152.48	399.49
1999	251.19	153.47	404.65
2000	260.00	185.14	445.13
2001	264.37	192.20	456.57
2002	264.63	187.51	452.14
2003	272.76	200.19	472.96
2004	287.70	223.35	511.05
2005	312.96	262.65	575.61
2006	347.25	304.36	651.61
2007	395.64	302.52	698.16
2008	415.52	295.02	710.54
2009	443.14	290.49	733.63
2010	462.74	290.39	753.13
2011	479.81	314.24	794.06

Source: Saudi Arabian Monetary Agency (SAMA), *Annual Report*, No. 47. World Bank, *World Bank Development Indicator*.

Table (A-3): Dynamic Ordinary Least Squares (DOLS) Regression Results

Dependent Variable: LOG(PC)				
Method: Dynamic Least Squares (DOLS)				
Date: 09/14/13 Time: 21:54				
Sample: 1986 2008				
Included observations: 23				
Cointegrating equation deterministics: C				
Fixed leads and lags specification (lead=1, lag=1)				
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth =3.0000)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(Y)	0.400966	0.201309	1.991797	0.0744
R	-0.012668	0.005740	-2.206893	0.0518
LOG(W)	0.021128	0.147531	0.143211	0.8890
C	2.955139	0.481722	6.134531	0.0001
R-squared	0.990336	Mean dependent var	5.557490	
Adjusted R-squared	0.978739	S.D. dependent var	0.195450	
S.E. of regression	0.028499	Sum squared resid	0.008122	
Durbin-Watson stat	1.489418	Long-run variance	0.001081	