

## DETERMINANTS OF PRIVATE INVESTMENT IN UNITED ARAB EMIRATES

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### Abstract

The purpose of the study is to determine key factors influencing private investment in the UAE. The study examines eleven independent variables as determinants of private investment, according to adjusted data in the UAE for the period between 1990 and 2010. The methodology aims to formulate a linear regression model for private investment after testing multicollinearity between independent variables. The Augmented Dickey-Fuller and Phillips-Perron tests will be utilized to investigate the stationarity of the variables. Then, Johansen Cointegration test will be conducted. Finally, the Vector Error-Correction Model will be fitted to the private investment data. Findings include that the real public expenditure stimulates the private investment more than the non-oil GDP. More specifically, *ceteris paribus*, a ten-million Dirham increase in the real public expenditure stimulates private investment by 3.16 million Dirhams; however a ten-million Dirham increase in the non-oil GDP will result only in a 1.11million Dirham increase in the private investment. Practical implications lead into further studies as the causality between economic growth and investment, in addition to the relationship between private and public investments. The value of the study is that the private investment depends, first of all, on real public expenditures. The fiscal policy should play a vital role to stimulate private investment and smooth business cycle.

**Keywords:** Private Investment, Non-oil GDP, public expenditures, Vector Error-Correction Model

### INTRODUCTION

UAE's economy has been a relatively oil-dependent economy. Contribution of oil sector to GDP reached 66% in 1975 as a result of the first oil boom in which the international demand on oil increased and the OPEC corrected oil prices (UAE Ministry of Planning, 1987). The non-oil economy, at the beginning of 1970s, can be described as heavily dependent on oil exports which financed government revenues, small size of private sector, scarcity of agricultural and mineral resources, and shortage of manpower and their skills. Economic diversification has become a strategy for the government and the whole society (Al-Jundi, 2012). Then, the performance of a large and empowered private sector will determine the future of the UAE economy as stated in the Abu Dhabi Economic Vision 2030 (Abu Dhabi, 2008, p. 5). As a result, the government has invested oil revenues to build and expand infra-structures and finance basic economic activities. The private sector has enjoyed the positive investment climate. Comprehensive development process and political stability resulted in reducing oil contribution from 66% (1975) to 31% (2010) (UAE National Bureau of Statistics, 2013). However, the contribution reached a minimum level of 21% (1998) (UAE Ministry of Economy, 2013). Aggregate production is a function of capital and labor (Antras, 2004). Investment is an addition to capital stock as (Case, Fair, & Oster, 2009):

Capital<sub>end of period</sub> = Capital<sub>beginning of period</sub> + Net Investment [1]

Net Investment = Gross Investment – Depreciation [2]

Private investment is a key for economic growth rate which the government takes a role for building infra-structures (Bakare, A theoretical analysis of capital formation and growth in Nigeria, 2011). The private sector in the UAE activates in the non-oil economy in addition to public sector. As non-oil economy expanded, the future of the whole economy will depend

on the private investment. According to data discussed in the section of data adjustments, the ratio of private investment to total investment has increased from a minimum of 30% (1992) to a maximum of 70% (2007). The importance (percentage) of public and government investment has decreased during the period of 1990-2010.

Private investment as a ratio to non-oil GDP fluctuated due to the business cycles. The ratio for the whole period of 1990-2010 estimated more than 16%. The minimum level was 11.5% in 1992 and the estimated maximum level was 26% in 2010. To have a sight of the trend, the average of 1990-1995 was 14.6% and it became 15.9% during 1995-2000. Then, it dropped back to 14.8% during 2000-2005, while it reached 21% during 2005-2010 because of the rapid expansion of the construction sector. In general, private investment is too sensitive to changes in environment and becomes a source of instability.

But, how can we increase the ratio of private investment to non-oil GDP? A general and simple answer to this question is economic and political stability. However, understanding other determinants of private investment may help in finding ways to restructure economic policies and therefore private investment.

This paper comprises seven sections. Firstly, literature review presents results of recent international paper which studied private investment in developed and developing countries. Secondly, methodology section formulates factors affecting private investment. Third, data adjustments explain the process of transferring data from current to fixed prices. Fourth, modeling section suggests the private investment model and tests which should be considered. Fifth, findings are reported and a summary of the results of the ADF and PP tests for stationarity, Johansen test for cointegration, and standardized cointegrating vector are presented. Sixth, conclusions and recommendations are recorded just before the seventh section of references.

## LITERATURE REVIEW

This section focuses on determinants of private investment in different countries, especially developing countries, as presented or proved by recent research.

In Pakistan, Haroon & Naser (2011) examine that private investment is a function of inflation rate (they use consumer price index to refer to inflation rate), indirect taxes, subsidies given by the government, Discount rate (they use interest rate to refer to discount rate used by the central bank), gross domestic product, domestic savings, government development expenditures, amount of debt servicing, and past private investment (it should be used to refer to absorptive capacity of investment).

In Ghana, Asante (2000) states that private investment is a function of lagged value of private investment (as a proxy for investment climate), public investment, real exchange rate, real credit, interest rate, macroeconomic stability, growth rate of GDP, investment deflator (as a proxy for costs of capital), political instability (Dummy variable = 1 for successful coup years and zero otherwise), corporate taxes, and terms of trade. Another study about Ghana recommends that inflation rate, exchange rate, public investment, GDP, trade openness, aid, credit and external debt strongly influence private investment (Naa-Idar, Ayentimi, & Frimpong, 2012). In Iran, Ahangari & Saki(2012) assume that private investment is a function of instability index, government investment, income from oil & gas exports, value added of industry, and banks' credits. Additionally, the instability index is influenced by inflation rate, budget deficit, foreign debt and money supply.

In Jordan, Bader & Malawi (2010) declare that real interest rate has a negative impact on investment (proxied by gross fixed capital formation), while the income level (proxied by GDP) has a positive impact on investment. It is found in Fiji that real private investment is a function of real public investment, real GDP growth, real lending rate, real private sector credit, real effective exchange rate index, terms of trade index, and real unit labor cost (Seruvatu & Jayaraman, 2001).

In Gambia, Onwioduokit & Jarju (2006) discuss determinants of private investment which include real GDP growth, public investment, real interest rate, import plus export as a ratio of GDP, growth rate of banking sector credit to the private sector, debt service ratio and inflation (as a proxy for stability of economic environment).

In Thailand, it is found that an increase in economic growth leads to an increase in private investment. An increase in private domestic credit and output gap (the difference between real output and potential output) results in an increase in private investment. As capital cost increases, private investment decreases. An Uncertainty (including inflation rate and exchange rate) pushes down the investment. Public investment has a positive relationship with private investment and both of them have a complementary nature. Depreciation of the currency leads to lower exports and lower private investment (Jongwanich & Kohpaiboon, 2008).

In Romania, a study refers factors affecting gross fixed capital formation. They are comprised of government expenditures, construction activity, machine production activity, industrial production, the degree of coverage of imports by exports, exchange rate, broad money supply in real terms and real gross wage in the Romanian economy (Scutaru, Saman, & Stanica, 2008).

Private investment in Brazil is positively influenced by output, public investment and financial credit. However, there is a negative impact of the exchange rate on private investment,

i.e. depreciation of currency lowers private investment. Appropriate real interest rate and inflation rate, to those of its trading partners, have a positive impact on private investment (Ribeiro & Teixeira, 2001).

In China, Investment has tremendously been increased due to an increase in rate of return on capital and savings. Lower inflation rate and interest rate cause wider investment. An expansion in education leads to expand investment with high effectiveness and a rapid rise in economic growth results in corresponding growth in investment (Knight & Ding, 2009).

In Nigeria, Bakare (2011) concludes that public investment is competitor (not complementary) to private investment. A depreciation of the exchange rate has a negative influence on private investment because it makes imports of capital goods and raw materials more costly for investors. High inflation negatively influences private investment but moderate inflation around 2% has a positive influence. An increase in corruption index and political instability prevent investment to grow. A rise in saving and an improvement in infrastructure (proxied by power supply) stimulate private investment.

It is found in Malaysia that the availability of financial resources has a strong positive impact on private investment while macroeconomic uncertainty has a negative influence. Both foreign direct investment and public investment have a complementary effect on private investment. A greater level of aggregate output raises the level of private investment (Ang, 2010).

In Argentina, Acosta & Loza (2005) prove that investment decisions, in the short run, are

determined by exchange rate, trade liberalization and aggregate demand. In the long run, capital accumulation depends on well-developed financial and credit markets in addition to fiscal sustainability. In general, socio-political instability hinders private investment according to investigation in twenty five developing countries over twenty one years (Le, 2004).

## METHODOLOGY

The final goal of the study in question is to determine the most important factors influencing private investment in the UAE. Study will examine eleven independent variables as determinants of private investment. Variables are selected due to three criteria as follows:

- As suggested by recent international research mentioned in the section of literature review.
- As understood from the features and facts of the UAE economy which were discussed earlier in the section of trends of investment.
- Limitation of data available determines which factors can be considered or not. The next section will shed light on this problem. That may open door for further studies to examine other variables mentioned in the international research.

The Table 1 describes the variables considered. By using statistical tests, some independent variables will be omitted.

Additionally, the study will introduce and examine a regression model for private investment as a function of most important determinants. The paper will focus on testing a question: Which factors impact the size of private investment relative to non-oil economy in the UAE?

**Table 1: Determinants of private investment in the UAE**

No.	Symbol	Variables	Description
0	$Y_t$	Private investment	A dependent variable and proxied by gross fixed capital formation in the private sector
1	$D_t$	Non-oil GDP	Refer to the level of economic activities and works as proxy for aggregate demand
2	$G_t$	Real public expenditure	As a main tool to stimulate economic activities financed mainly by oil revenues
3	I	Public & government investment	Represented by gross fixed capital formation in the Public & government sectors to exam whether it is complement or substitute to private investment
4	A	Manufacturing Industries Value Added	GDP in the manufacturing industries and refer to the degree of diversification in the economy
5	C	Construction value added	GDP in construction sector as a provider of a kind of capital goods
6	E	Compensation of employees	Refer to wages as a reward for labor
7	S	Operating surplus	Refer to profits as a reward for capital
8	M	Imports of goods & services	As a provider of capital goods
9	B	Real credit	Refers to loans given to private sector
10	H	Interest rate	Refers to the cost of borrowing mony to finance new projects

11	P	Consumer price index	A price index which covers a basket of consuming goods and services
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## DATA ADJUSTMENTS

According to the study methodology, it is crucial to obtain a time series for all variables mentioned in Table 1 at fixed prices for the period 1990-2010. After investigation, it is found that the international organizations could not offer most of the variables. They provide data on some variables at current prices. Look, for instance, at the databases of UN statistics Division (2013), The World Bank (2013), and International Monetary Fund (2013).

There is not a consistent series of data in the UAE national recourses. The UAE National Bureau of Statistics has recently been established since 2009. The UAE Ministry of Economy was in charge of publishing data before 2009. Old Data was published by the UAE Ministry of Planning in earlier years. The UAE National Bureau of Statistics (2013) published data from 2001-2011 at constant 2007 prices. GDP deflator as an overall price index was calculated, for example, in 2010 as:

*GDP deflator in 2010*

$$= \frac{\text{Nominal GDP for 2010}}{\text{Real GDP for 2010}} \times 100 \quad [3], \text{ using 2007 as a base year}$$

The UAE Ministry of Economy (2013) published data from 1993-2001 at current and constant 1995 prices. GDP deflator is calculated to similar formula as equation # 1. The UAE Ministry of Planning (1998) published data of national accounts from 1990-1993 at current and constant 1985 prices. GDP deflator is found. To find a consistent series of GDP deflator using 2007 as a base year, it was converted from old base to a new one due to equation # 4:

$$= \frac{\text{DGP deflator}_{2000} \text{ Using 1995 as base} \times \text{DGP deflator}_{2001} \text{ Using 2007 as base}}{\text{DGP deflator}_{2001} \text{ Using 1995 as base}} \quad [4]$$

As we have a complete series of non-oil GDP deflator ( using 2007 as a base year), it is used to convert data of all variables in the study at current prices for the period 1990-2010 to data at fixed prices of 2007 using the equation # 5:

$$\text{Real GDP for 2000} = \frac{\text{Nominal GDP for 2000}}{\text{DGP deflator}_{2000} \text{ Using 2007 as base} / 100} \quad [5]$$

Equation # 5 helped to convert data from current prices to fixed prices where variables published in current prices only; such as compensation of employees, Public Expenditure, and Credit. Since value added can be divided between compensation of employees and operating surplus, the latter is found due to equation # 6:

$$\text{Operating surplus} = \text{Non-oil GDP} - \text{Compensation of employees} \quad [6]$$

Credit and interest rates are found for the recent years from the Central Bank of UAE (2013). However, the earlier data of credit was found in ministries of planning and economy. Econometric analysis can not be easily practiced. There is severe lack of data especially for

the period before 2000. It is recommended for the UAE National Bureau of Statistics to gather and publish quarterly macroeconomic data. That may offer detailed data for enriching studies. To encourage researchers in the UAE to shift from qualitative analysis to quantitative measurements, the UAE National Bureau of Statistics along with local centers of statistics should cover and collect data on new variables such as: the categories of investment into residential investment and components of non-residential investment, operating surplus at fixed prices and annual averages of interest rates on loans given to the private sector.

## MODELING

When the matter comes to Macroeconomics, we should return back to John Maynard Keynes. He suggested, after the great depression of the 1930s, that the level of aggregate demand for goods and services determines the level of aggregate output and employment. Keynes as most macroeconomists believed that governments could intervene in the whole macroeconomy and stimulate the level of aggregate output (Case, Fair, & Oster, 2009). Economically, the most important incentives for private sector to invest are aggregate demand proxied by non-oil GDP in UAE and real public expenditure as a main tool to stimulate economic activities which is financed mainly by oil revenues. Thus private investment model can be specified as follows:

$$Y_t = \beta_0 + \beta_1 D_t + \beta_2 G_t + \varepsilon_t \quad [7]$$

Where  $Y_t$  is the private investment,  $D_t$  is the non-oil GDP and  $G_t$  is the real public expenditure. Other potential determinants have been excluded from the model to avoid the expected severe multicollinearity rising from the high correlation between these determinants and the two included variables. Additionally, there is strong doubt about the quality of data for the period 1990-2010. As mentioned earlier, data is converted from current prices to fixed prices of 2007. Doubt has been raised especially for data before 2000. The UAE National Bureau of Statistics should work on publishing data quarterly. That will increase the length of time series for macroeconomic variables. Macroeconomists are advised, then, to examine the impact of other determinants on private sector.

Consider the Vector Autoregressive (VAR) model with  $p$  lags

$$\mathbf{y}_t = \mathbf{v} + \mathbf{A}_1 \mathbf{y}_{t-1} + \mathbf{A}_2 \mathbf{y}_{t-2} + \dots + \mathbf{A}_p \mathbf{y}_{t-p} + \boldsymbol{\varepsilon}_t \quad [8]$$

where  $\mathbf{y}_t$  is a  $k$ -vector of  $I(1)$  variables,  $\mathbf{v}$  is a  $k$ -vector of parameters,  $\mathbf{A}_1 - \mathbf{A}_p$  are  $k \times k$  matrices of parameters and  $\boldsymbol{\varepsilon}_t$  a  $k$ -vector of disturbances. Following (Johanson, 1995), the above VAR model may be rewritten using a Vector Error-Correction Model (VECM) as

$$\Delta \mathbf{y}_t = \mathbf{v} + \boldsymbol{\Pi} \mathbf{y}_{t-1} + \sum_{i=1}^{p-1} \boldsymbol{\Gamma}_i \Delta \mathbf{y}_{t-i} + \boldsymbol{\varepsilon}_t \quad [9]$$

$$\text{where } \boldsymbol{\Pi} = \sum_{j=1}^p \mathbf{A}_j - \mathbf{I}_k \text{ and } \boldsymbol{\Gamma}_i = \sum_{j=i+1}^p \mathbf{A}_j.$$

Prior to fitting the above VECM, we should investigate the time series properties of the private investment data. First, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests will be utilized to investigate the stationarity of the variables and determine the integration order of each variable. Next, the optimal lag length ( $p$ ) in equation (9) is specified and then Johansen Cointegration test will be conducted to determine the cointegration order in the private investment data. Finally, based on the empirical results of the preceding tests, the VECM will be fitted to the private investment data.

## FINDINGS

The results of the ADF and PP tests for stationarity are reported in Table. The ADF and PP tests for unit roots indicate that the three variables are non-stationary while their first differences are stationary. That is, the variables included in equation (9) are I(1). Therefore, the Johansen (1995) multivariate cointegration technique can now be used to test the existence of a long-run equilibrium relationship for private investment.

Table 2: Augmented Dickey-Fuller and Phillips-Perron Tests

Variable	Test Specifications	ADF Statistic	PP Statistic	Optimum Lag
<i>Y</i>	Constant and Trend	-0.962	-1.593	1
$\Delta Y$	Constant	-4.028**	-17.978**	0
<i>D</i>	Constant and Trend	-1.997	-5.883	1
$\Delta D$	Constant	-3.483*	-15.621*	0
<i>G</i>	Constant and Trend	-1.483	-5.234	1
$\Delta G$	Constant	-3.443*	-16.947*	0

Note: \* and \*\* indicate significance at 5% and 1% levels, respectively

Since all the variables are found to be non-stationary using both the ADF test and the PP test, and are stationary in first difference, cointegrating relation can exist between the variables. Table 3 shows the results of Johansen test for cointegration. The trace and maximum eigen value statistics indicate the rejection of no cointegration hypothesis and the acceptance of the hypothesis of at most one cointegration equation.

Table 3: Johansen Test for Cointegration

Maximum Rank	Eigenvalue	Trace Statistic	5% Critical Value	Maximum Statistic	5% Critical Value
0	.	62.038	29.68	54.763	20.97
1	0.944	7.275*	15.41	7.272*	14.07
2	0.318	0.00013	3.76	0.0026	3.76

Table 4 reports the long-run parameters of the cointegrating vector equation. The parameters are highly significant with the expected sign. The cointegrating vector equation is written as  $Y_t = -20927 + 0.1115D_t + 0.3157G_t[10]$

Based on equation (10), the real public expenditure stimulates the private investment more than the non-oil GDP. More specifically, ceteris paribus, a ten-million Dirham increase in the real public expenditure stimulates private investment by 3.16 million Dirham; however a ten-million Dirham increase in the non-oil GDP will result only in a 1.11million Dirham increase in the private investment.

Table 4: Standardized Cointegrating Vector

Cointegrating Equation	Coefficient	Standard Error	z statistic
<i>Y</i>	1	-	-
<i>D</i>	-0.1115	0.0063	-17.76**
<i>G</i>	-0.3157	0.0374	-8.44**
Constant	20926.8	-	-

Note: \*\* indicates significance at 1% level

A significant part of an increase in aggregate demand or expenditures goes as a leak from the

circular flow of economic activities. Imports in oil economies, such as the UAE, represent a high ratio to GDP and more increasingly to non-oil GDP. Imports of goods and services ratio to GDP represents 40.7% (2001) and increases to 74.5% (2012) (UAE National Bureau of Statistics, 2013). The multiplier must be so low in such economy. The production capacity is still small and the whole economy is still exposed to international crises.

## CONCLUSIONS

It can be safely said that private investment in the UAE heavily depends on the level of aggregate demand. The latter is proxied by non-oil GDP (The local level of economic activities) and real public expenditures. The government still plays an important role to stimulate the level economic activities and more specifically the private sector. Conclusions and recommendations are as follows:

1. Since all the variables are found to be non-stationary using both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, and are stationary in first difference, cointegrating relation can exist between the variables. The trace and maximum eigen value statistics indicate the rejection of no cointegration hypothesis and the acceptance of the hypothesis of at most one cointegration equation.
2. Each of independent variables (real public expenditures and non-oil GDP) has a positive impact on private investment in the UAE.
3. The real public expenditure stimulates the private investment more than the non-oil GDP. More specifically, *ceteris paribus*, a ten-million Dirham increase in the real public expenditure stimulates private investment by 3.16 million Dirham; however a ten-million Dirham increase in the non-oil GDP will result only in a 1.11million Dirham increase in the private investment.
4. A significant part of an increase in aggregate demand or expenditures goes through leakage from the circular flow of economic activities. Imports in oil economies, such as the UAE, represent a high ratio to GDP and more increasingly to non-oil GDP. Imports of goods and services ratio to GDP represents 40.7% (2001) and increases to 74.5% (2012).
5. The multiplier must be so low in such economy. The production capacity is still small and the whole economy is still exposed to international crises.

## RECOMMENDATIONS & FUTURE RESEARCH

1. Econometric analysis can not be easily practiced, there is severe lack of data especially for the period before 2000. It is recommended for the UAE National Bureau of Statistics to gather and publish quarterly macroeconomic data. That may offer detailed data for enriching studies.
2. To encourage researchers in the UAE to shift from qualitative analysis to quantitative measurements, the UAE National Bureau of Statistics along with local centers of statistics should cover and collect data on new variables such as: the categories of investment into residential investment and components of non-residential investment, operating surplus at fixed prices and annual averages of interest rates on loans given to the private sector.
3. The study suggests further research on:



- The relationship between private and public investments: An investigation should shed light on the complementary or competitive nature of investments.
  - Causality between economic growth and investment: An investigation should examine whether the flow of causality runs in two directions or in one direction.
  - The impact of real credit given to private sector, interest and inflation rates on private investment: An investigation should prove whether these variables are important as mentioned in the international papers or not, due to the characteristics of the UAE economy.
4. Private investment, over the past 10 years, has fluctuated around 16% of the non-oil GDP. In general, private investment is too sensitive to changes in environment and becomes a source of instability. Since private investment depends first of all on real public expenditures, the fiscal policy should play a role to stimulate investment and smooth the business cycle.

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