



## DETERMINANTS OF HOUSING PRICES IN AN OIL BASED ECONOMY

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## ABSTRACT

*This paper is trying to analyze the determinants of housing prices in an oil-based economy, where the price of oil plays a major role in such economies. It is also common to find that government spending represents the most important component of aggregate spending and that governments usually play a central role in the provision of public services to citizens at substantial subsidies, housing is on top of them. The paper is trying to identify the role played by oil price in the housing market in Kuwait. The model is composed of four major determinants of house prices including the price of oil, government expenditures, inflation rate and interest rate. Results confirm the role played by the four factors in determining the price of houses. Variance decomposition indicates that up to 10 quarters, 94.3% of the forecast error variance in housing prices is explained by house price itself, whereas, only 2.3%, 1.6%, 1.5% and 0.8% are explained by Interest rates, inflation rates, government expenditures, and price of oil respectively. The oil price does not seem to play an important impact on price changes in Kuwait. One important recommendation is for the government to relax its monopoly on land and invite the private sector to come up with housing solutions to increase the supply of houses in the private housing market and reduce the upward pressures on house prices.*

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**Keywords:** Oil based economies, Housing affordability, House prices, Government expenditures, Oil prices, Interest rates, Inflation rates and variance decomposition.

Received: 16 January 2016/ Revised: 12 March 2016/ Accepted: 29 March 2016/ Published: 7 April 2016

## Contribution/ Originality

The paper's primary contribution is finding that oil price does not seem to be an important determinant of housing prices in the oil-based economy of Kuwait.

## 1. INTRODUCTION

The governments of the oil rich economies of GCC area are generally committed to provide their people with high living standards, Where most of necessities are provided the government such as schools for education, hospitals for health care.. etc, including housing. The provision of housing facilities to citizens requires huge investments and

intricate planning. Due to this reason, housing services is not only getting short of demand but also extremely unaffordable due to continuous price rises.

Kuwait is such an economy where the government controls the housing sector. In 1976, the government established the Public Authority for Housing Welfare (PAHW) with the purpose of providing housing facilities (encompassing all allied facilities) to eligible residents no later than a period of five years after application. The service includes provision of land and finances for building the house. However, the department fell short of expectations and failed to satisfy the public demand for new houses, consequently, the housing requests are piling over time. Public concern about housing security is mounting. More recently, a survey conducted by the Parliament of Kuwait shows that housing is the public's main concern and of top priority in their priority list. PAHW data also shows that in the small economy of Kuwait, more than hundred thousand families are waiting for their turn in the waiting list, and that the average waiting time is increasing to 13 years after filing applications. The issue in hand becomes even more complex as housing is becoming seriously unaffordable in Kuwait's and is now ranked as one of the highest in the world.

In a typical oil based economy like Kuwait, revenue generated from the oil exports comprises the bulk of GDP and public revenues. Thus in a State owned housing mechanism, government spending forms the single most determinant on which housing facilities are dependent. In such economy, we expect the price of oil to play an important determinant of house prices. The literature also shows that interest rates and inflation trends, among other factors are major determinants of house prices. The perceived role played by these determinants in the case of Kuwait, has not backed with any scientific proof. A need is therefore, felt to analyze the problem of housing price determination in Kuwait in order to validate and quantify the role played by these determinants.

## 2. LITERATURE REVIEW

Many studies conducted around the world about the determinants of real estate prices and the factors that control their trends in the short run and long run, for example,

[Hin and Ho \(1999\)](#) tested for co-integration of the price dynamics of private housing, they found that private housing price movement is influenced by changes in real GDP, private housing development and previous private housing prices.

In a study about the determinants of housing prices in Spanish urban areas, [Paz \(2000\)](#) is intended to find evidence of the relationship between residential prices and economic determinants such as wages, migration and income structure etc., the study shows that salaries of the workers have impacted the house prices. In metropolitan cities the prices of houses depend upon the existing size of the population and its growth. It is also noted that the increase in salaries over the period reflected in the growth of the number and prices of the houses. Coastal areas showed more increase in house prices as compared to the interior areas. Growth of population is also evident as one the main determinants of house prices. [Paz \(2003\)](#) investigates a model of the determinants of housing prices in Spanish cities, in which Paloma tried to find evidence of relationship between residential prices and other economic and demographic factors. It is found that beside other factors like growth of population, availability of new houses and construction activities, the growth of housing prices also depends upon the purchasing power of people and their wages earned. Financial system of mortgage also played a vital role in determining housing prices.

[Herring \(2006\)](#) also investigated the booms and busts in housing markets and found that they are often been associated with declines in economic activity, financial instability and large borrowing costs. In New Zealand banks plays a vital role in housing market booms. The policies are not debtors friendly like US housing market but creditors friendly. Usually long term fixed interests are not available by banks. Even refinancing can only be made upon paying large penalties and thus the indirect impact of banks in the drop in house prices may exceed the direct impact.

Ekstrand and Wrede (2006) try to find out the determinants of regional house prices in urban and rural areas in Sweden. The authors noted that urban areas witnessed higher price increases than in the rural areas. They also find that the demand factor is more influential in urban areas, while both demand and supply impact the growth of house prices in rural areas. In rural areas the cost of land is cheaper than the cost of building though in urban areas land is more expensive.

In an attempt to explain the rapid rise of Swedish houses, Carl Andreas Claussen (2013) found that the rise in house price is due to the fall in real mortgage rate by 25%, 62% is by increase in real disposable income, 8% goes to household real financial wealth and 4% increase is left unexplained in the paper. The main conclusion is that houses are not overpriced in Sweden.

Ozsoy and Sahin (2009) analyze the factors affecting housing prices in Istanbul, Turkey. They found that beside location/area, the most dominating factors in the determination of house prices are sizes, elevators, available security measures, existence of central heating units and view of the house.

Lee (2009) uses an exponential-generalized autoregressive conditional heteroskedasticity (EGARCH) model for analyzing the volatility and volatility clustering effects. It is found that Australian housing market is consistent as compared to other markets and the volatility of housing series is not constant over the time. At national level, inflation is also one of the determinants of housing price volatility. This reveals and suggests that some factors must be taken in consideration while formulating the national housing policy and an in depth study of house price volatility is necessary by investors and the policy makers at the national level.

Agnello and Schuknecht (2009) investigate the booms and busts of real estates prices in 18 industrialized countries from various continents. They found that economic costs depend on the boom's magnitude, money and credit development. Furthermore, the short term interest rates, local and global money or credit and the incidence of mortgage market deregulation affect the probability of booms and busts significantly. Regulatory policies that slow down the money and credit growth also lower the boom probabilities. Finally, global liquidity are found to play a significant role in price booms and busts.

Kagochi and Mace (2009) try to investigate the determinants of demand for single family housing in Alabama urbanized areas using a model incorporating macroeconomic and housing-related variables to determine the demand of single houses. The research findings state that the prices of a single house are influenced by both national economic factors and other local factors. The increase, in the new single house demand, depends on the growth of population and migration. On the other hand, demand reduces when there are high costs of building a new house, high mortgage rates and high unemployment factors.

Simon (2010) in a study about the determinants of housing prices in South East Queensland in Australia found that supply and demand factors are drivers of real median prices. The study shows that it is evident that over the last 20 years, the supply of residential land responded to increase in prices.

Chen and Xie (2010) focused on fundamental determinants of housing prices in three major developed cities of China and whether the price changes in global housing has an impact in China housing prices. They found that in big cities of China, a dramatic increase in sales of commercial houses have been noticed within last few years. The sale of commercial houses as per GDP increased from 5.89% in 2002 to 13.12% in 2009 in China. They used a model of six determinants: income per capita, interest rate, stock price, land price, construction cost and population. According to their results, there are no sufficient policies made for implementation to overcome the heated market.

Hadavandi (2011) in a study about housing price forecasting in Iran found that the main determinant of house prices is the land price. His conclusion is that the government has to take necessary action to control the price fluctuations of the land in order to control the soaring housing prices.

Finally Fereidouni and Bazrafshan (2012) also try to estimate the impact of the determinants of returns on housing in Iran and found that the important major determinants of returns on housing are changes in inflation, population growth and also changes in unemployment and GDP but to a lesser extent.

### 3. THE PUBLIC HOUSING POLICY IN KUWAIT

At the moment, the state of Kuwait exclusively controls the process of providing housing care to its citizens through the allocation of land to provide new housing and the supply of infrastructure and other facilities, through the Public Authority for Housing Welfare (PAHW). Since its foundation, the state of Kuwait has adopted an approach that provides all the citizens of the State with housing services. For that purpose PAHW was established in 1974 to provide housing care to Kuwaiti families in different forms (Land, house, flats). Housing welfare is provided to Kuwaiti families, according to their priority in registration of applications at PAHW.

At the moment, the government fully controls the operations of real estate development in the State, including the allocation of land, the provision of infrastructure and other facilities, through the General Organization for Housing Welfare

Historically, in 1956, the Department of State Property was established with a task to distribute state houses to citizens. To support citizens with the required credit, the Saving and Credit bank was established in 1965 to grant beneficiaries with mortgage loans on a very long term basis. In 1975, the Ministry of Housing was established with the aim of distributing government houses to the people.

The Public Authority for Housing Welfare will design and implement the establishment of newly added suburbs and cities. It will also supervise the establishment of road networks, sewage networks, freshwater supply networks, land phone networks, electricity, with respective ministries and public agencies. Police stations, health centers and clinics, schools and shopping centers as well as other daily life facilities are also supplied in coordination with other public institutions in charge.

The law also states that the state has to provide rent allowance to the citizens entitled to housing welfare until they obtain their houses. The head of the family is eligible to a monthly rent allowance of KWD 150 (US \$ 525) to be paid on a monthly basis until the beneficiary receives housing care. The bill for rent allowance is increasing over time, it is estimated that the average amount of rent allowance paid to each family is KWD 22.5 thousands (about 80 thousand US dollars).

Other forms of government support to the citizens is subsidized mortgage loans obtained through the Saving and Credit Bank (bank of credit nowadays) of KWD 70 thousand (about \$ 250000), where the state provides interest free housing loans. The State also bears (fully or partially) the costs of infrastructure and other facilities for the housing projects implemented by PAHW or the plots of land distributed by the authority.

In 1995 Law No. 27 concerning private sector's contribution into the reconstruction of state-owned space areas for housing welfare purposes was introduced to enhance the participation of the private sector in providing the housing services to the people of Kuwait. But the law failed to support the participation of the private sector in public housing activities.

Despite its efforts to ease the housing problem, it is evident that the government's efforts to solve the housing problem have failed, as the number of eligible citizens waiting in the queue for their turn to get residential care is growing overtime.

### 4. THE HOUSING PROBLEM IN KUWAIT

There is no doubt that the problem of housing is one of the most important problems in Kuwait at the moment. In a recent survey conducted by the Parliament of Kuwait (Majlis Al-Ummah), it was found that housing is the main priority for the people of Kuwait. Although PAHW is assumed to provide housing welfare to eligible persons in no

later than five years from the date of registration of the application for obtaining housing welfare, the average waiting period substantially exceeded that limit, it is estimated that a family applied for residential care will have to wait about 13 years. Till January 2014 there have been about 112 thousand families with unsatisfied demand for housing care, a substantial number by Kuwaiti standards.

Kuwait has one the fastest population growth rates worldwide, which means that given the current performance of the government to support people with housing services, the housing problem will be complicated even more in the future, as the number of people eligible for housing care increase. Table no. 1 shows the numbers of new applications and the accumulation of the unsatisfied demand for housing services since 1990. The number of new applications increased from just 29 new applications in 1990 to 8491 new applicants in 2013. This growth reflects the high growth rates of population in Kuwait. Due to inability to deal with the growing number of applications, the number of families registered for housing welfare is increasing overtime from just 166 in 1990 to 111891 in 2014. The average growth rate of unsatisfied demand for housing welfare services is found to be 35.2%, which is higher than the average growth rate of population or income per-capita in the country.

**Table-1.** Growth of New Applications and Unsatisfied Demand for Public Housing care (1990-2014)

Year	No. of New Applications	Unsatisfied Demand for public housing services	Rate of Growth (%)
1990	29	166	
1991	81	248	49.4
1992	335	590	137.9
1993	402	992	68.1
1994	464	1460	47.2
1995	709	2185	49.7
1996	1536	3774	72.7
1997	2374	6253	65.7
1998	2642	8996	43.9
1999	2796	11824	31.4
2000	3034	14889	25.9
2001	3755	18692	25.5
2002	4287	23044	23.3
2003	5589	28721	24.6
2004	6396	35126	22.3
2005	7120	42256	20.3
2006	9430	51691	22.3
2007	8688	60391	16.8
2008	8216	68611	13.6
2009	7815	76428	11.4
2010	8027	84458	10.5
2011	8009	92473	9.5
2012	8403	100965	9.2
2013	8491	108288	7.3
2014	3392	118991	
		Average growth rate	35.2

\* Data for June 2014.

**Source:** The Public Authority for Housing Welfare.

Given these figures of unsatisfied demand for housing care, the current system proves to be non-sustainable, and if it continued to work in its current form, it will carry a lot of risk for the country. The government dominance of the

housing care system needs to be reviewed and the private sector participation in extending the supply of private housing should be enhanced.

As a result of the government failure to tackle the housing problem, the price of land spiked. The following graph shows the average price of land in different governorates in Kuwait from 2004-2011.

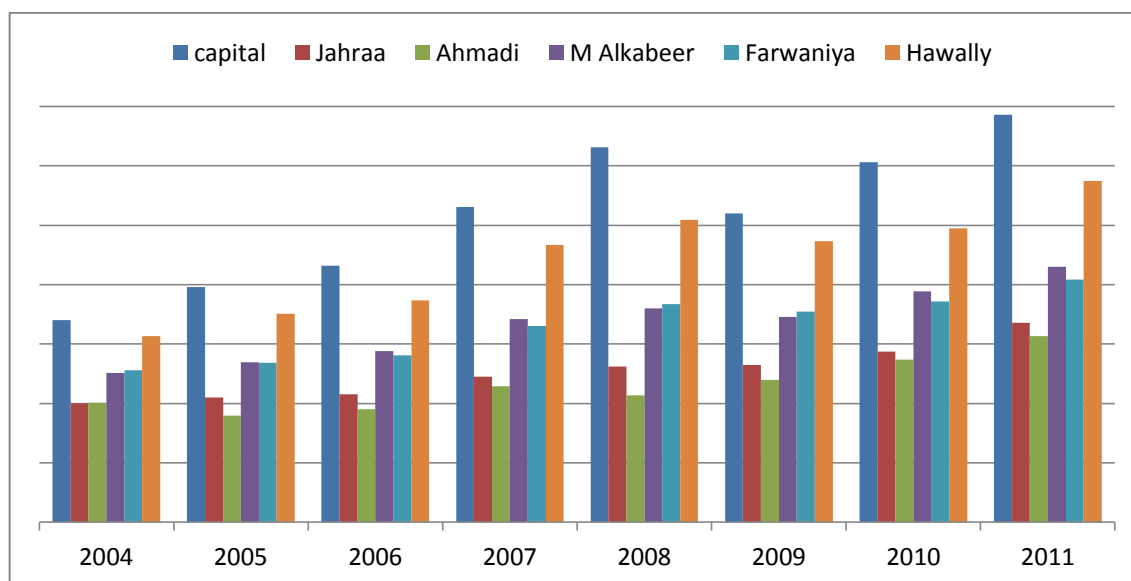


Figure-1. Average price Square meter of land 2004-2011 (Kuwaiti Dinars)

Source: based on calculations from the data base of the Ministry of Justice, Documentation Department.

## 5. HOUSING AFFORDABILITY IN KUWAIT

House affordability is a very important issue for its social and political implications in any society. That is why policy makers always try to facilitate access to houses using different mechanisms. Easy access to houses is an important determinant of public welfare. The constitution of Kuwait states the right of every citizen to have his own house as one of the basic welfare rights in the state.

In theory house affordability is estimated by dividing the price of the house on household disposable income of the family, if the outcome is generally high, this means that owning houses is very difficult and vice versa.

Accurate data about family income is not available. For this reason we are going to use a proxy of family income using published data about per-capita income. Annual Demographia International Housing Affordability surveys adopted specific criteria to measure housing affordability in high income countries such as Australia, Canada, Hong Kong, Ireland, Japan, New Zealand, Singapore, United Kingdom and the United States. Since Kuwait is also considered as a high-income country, whose per-capita income is among the top world-wide, we are going to adopt the ratings of the Demographia to build some measures about housing affordability in Kuwait.

According to the Annual Demographia International Housing Affordability surveys, if the median price of the house is 3 times the annual family income or less, then houses in the country or area are affordable. If it ranges between 3.1-4.0 times the annual family income, then houses are moderately unaffordable, while if it ranges between 4.1-5.0 times the annual family income, then houses are seriously unaffordable, and finally, if it is 5.1 or more times the family income, then houses are considered as severely unaffordable.

Demographia use these ratings for comparisons of housing affordability between international housing markets. Kuwait has never been included in these surveys. Calculations presented here are mainly for the purpose of comparison with other international housing markets.

Table 2 shows the average price of houses in different areas of Kuwait in US dollars. According to the table, average house prices in Kuwait ranges between about \$ US 416000 to about \$ 2 million, with an average country-wide price of about \$ US 1.1 million.

Table 3 shows the house price/family income multiples in different areas in Kuwait, which is considered as a measure of housing affordability. According to the table, except for only two areas in Kuwait: Alkhairan and Alwafra, house price income multiples are greater than 5.1, and ranges between 5.2 in Abohileefa to 23.2 in Hiteen, with an average country wide multiple of 12.2. This implies that house prices in Kuwait are severely unaffordable.

**Table-2.** Average house prices in \$ US (2013).

Area	Average price	Area	Average price	Area	Average price
Abdulla Assalem	1791923	Almansouriya	1122807	Alwaha	697396
Abo Alhasaniya	1121775	Almeseela	969418	Alyarmook	1096049
Abo Fiteera	988151	Alnahda	917895	Alzahraa	1505607
Abohileefa	456140	Alnaseem	666667	Alzothohr	779477
Abraq Khitan	1074758	Alnozha	1091400	Aqleqa	719298
Abullah Almubarak	1055863	Alomariya	801375	Arlrabiya	859989
Alaadan	1122807	Aloyoon	861442	Ashbiliya	1409351
Alaadilyia	1465509	Alqadesiya	1383926	Bayan	1441674
Alaqaqela	1436200	Alqairawan	973684	Fahad Alahmad	1052632
Alaardiya	873025	Alqasr	809916	Hediya	823393
Alahmadi	786404	Alqosor	798586	Hiteen	2013495
Alandalos	946358	Alqurain	1012782	Jaber Alahmad	1052632
Aldasma	1446895	Alrawdha	1333333	Jaber Alali	886112
Aldia	1122807	Alriqa	901754	Jleeb Alshuyoukh	791807
Aldoha	751811	Alrumaithiya	995060	Kaifan	1490565
Alfahaheel	596491	Alsabahiya	728358	Khaitan	898172
Alfaiha	1435196	Alsabahiya	561404	Mishref	1411930
Alfardoos	889439	Alsalmiya	1560411	Mubarak Alabdulla	1209923
Alfintas	1082460	Alsedeeq	1358540	Mubarak Alkabeer	836130
Ali Sabah Alsalem	627260	Alshaab	1551228	Qortoba	1261281
Aljabriya	1099691	Alshamiy	1695316	Saad Alabdullah	910986
Aljahraa	1196467	Alshohadaa	1549319	Sabah Alahmad	732168
Alkhairan	417544	Alsorra	1633684	Sabah Alnaser	831832
Alkhaleidiya	1233884	Alssalam	1917147	Sabah Alsalem	1005512
Almahbola	753684	Alsulaibekhat	608189	Salwa	1039379
Almangaf	1067179	Alwafra	415789	Sarq Alahmadi	773695
Average country-wide price					1058842

**Source:** extracted from the data base of the Ministry of Justice, Documentation Department.

The problem is that higher housing prices as well as high annual rises in these prices make houses a very attractive asset for investors and speculators, which continues to raise prices of houses and complicates the affordability of houses for most of the population of Kuwait.

As compared with the results of the 10<sup>th</sup> Annual Demographia International Housing Affordability Survey for the year 2013 which is published in 2014, housing affordability in Kuwait is among the severely difficult as compared to international housing markets of high income countries. Among the sample of the 10<sup>th</sup> Annual Demographia International Housing Affordability Survey presented in table 4, only Hong Kong comes first, then Kuwait is ranked second in terms of difficulty of buying a house for Kuwaiti families.

Table-3. House price/income multiples in Kuwait (2013).

Area	price/income multiple	Area	price/income multiple	Area	price/income multiple
Alkhairan	4.8	Alaardiya	10	Almansouriya	12.9
Alwafra	4.8	Alfardoos	10.2	Abo Alhasaniya	12.9
Abohileefa	5.2	Jaber Alali	10.2	Aljahraa	13.8
Alsabahiya	6.5	Khaitan	10.3	Mubarak Alabdulla	13.9
Alfahaheel	6.9	Alriqa	10.4	Alkhaleediya	14.2
Alsulaibekhat	7	Saad Alabdullah	10.5	Qortoba	14.5
Ali Sabah Alsalem	7.2	Alnahda	10.6	Alrawdha	15.3
Alnaseem	7.7	Alandalos	10.9	Alsedeeq	15.6
Alwaha	8	Almeseela	11.1	Alqadesiya	15.9
Aqleqa	8.3	Alqairawan	11.2	Mishref	16.2
Sabah Alahmad	8.4	Alrumaithiya	11.4	Ashbiliya	16.2
Alsabahiya	8.4	Abo Fiteera	11.4	Alaaqeela	16.5
Aldoha	8.6	Alqurain	11.6	Alfaiha	16.5
Almahbola	8.7	Sabah Alsalem	11.6	Aldasma	16.6
Sarq Alahmadi	8.9	Salwa	12	Bayan	16.6
Alahmadi	9	Abullah Almubarak	12.1	Alaadilyia	16.9
Alzothohr	9	Fahad Alahmad	12.1	Kaifan	17.1
Jleeb Alshuyoukh	9.1	Jaber Alahmad	12.1	Alzahraa	17.3
Alomariya	9.2	Almangaf	12.3	Alshaab	17.8
Alqosor	9.2	Alfintas	12.4	Alshohadaa	17.8
Alqasr	9.3	Abraq Khitan	12.4	Alsalmiya	17.9
Hediya	9.5	Aljabriya	12.6	Alsorra	18.8
Mubarak Alkabeer	9.6	Alyarmook	12.6	Alshamiy	19.5
Sabah Alnaser	9.6	Alnozha	12.6	Abdulla Assalem	20.6
Aloyoon	9.9	Alaadan	12.9	Alssalam	22
Arlrabiya	9.9	Aldiia	12.9	Hiteen	23.2
Average country-wide price/income multiple					12.2

Source: calculated on the bases of the data base of the Ministry of Justice, Documentation Department and Per-Capita income in Kuwait.

Table-4. Housing affordability in Kuwait compared with other countries.

Country	Price/income multiple
Hong Kong	14.9
Kuwait*	12.2
New Zealand	8
Australia	6.3
Singapore	5.1
United Kingdom	4.7
Canada	4.5
Japan	4
Ireland	3.7
United States	3.5

Source: Performance Urban Planning "10th Annual Demographia International Housing Affordability Survey: 2014", Volume 10.

\* Based on calculations of table 3 above.

## 6. THE MODEL

In oil based economies, such as Kuwait, oil revenues always represent the main source of government revenues. Government spending is also the main determinant of aggregate demand in these economies. Typically the public sector is the largest sector of the local economy, to the extent that the direction of many macro-variables including growth, inflation, asset prices .. etc., depend on how much the government will spend. In these economies public



spending is the primary engine of local economic activity, for this reason, we believe that trends in government spending will be reflected on the price of assets including houses.

In line with this hypothesis, the price of oil is expected to be the main determinant of the expected rates of growth of output, income, consumption, savings, investment and a long list of expected macro-variables in oil based economies. Oil price is expected to impact housing price trends. As the price of oil increases, it would improve expectations about aggregate demand and boosts the rates of return on different assets, particularly housing.

Also in these economies we often find the role played by the private sector is limited due to the dominance of the public sector on the course of economic activity, and therefore narrowing investment opportunities for private savings, which often tend to be directed toward real estate sector or the stock markets. With improved oil prices, private savings will move more and more to the real estate sector, fueling the demand for houses and raising their prices. Of course, it is expected that the opposite will happen when oil prices tend to decline.

Interest rate is one of the major determinants of the demand for housing. The cost of obtaining the necessary credit to finance home purchases will depend on the current levels of interest rates. It is expected to have a negative relationship between interest rates and the price of houses; higher interest rate boosts the cost of credit and thus dampens the demand for houses and thus their prices, and vice versa.

Finally, the demand for assets in general is supposed to reflect the inflationary trends in the economy, as inflation intensifies, individuals are expected to keep their savings in assets that provide a hedge against inflation, to protect the purchasing power of their savings. Real assets are on top of them, which are used by individuals in times of inflation. The price of houses is expected to be directly influenced by the rate of inflation.

Based on the above discussion the price of houses in the oil-based economy of Kuwait can be expressed as follows:

$$P = f(Gexp, Oilp, Int, Inf) \quad (1)$$

Where;

P = Housing prices

Gexp = Government expenditures

Oilp = Oil price

Int = Interest rate

Inf = Inflation rate

In a semi-log linear form the price of houses can be modelled in the following form:

$$\log p_t = \alpha_0 + \alpha_1 \log Gexp_t + \alpha_2 \log Oil_t + \alpha_3 Int_t + \alpha_4 Inf_t + \mu_t \quad (2)$$

where  $\mu_t$  is a disturbance term.

For a panel of housing prices in different governorates in the country, the price of houses would be;

$$\log p_{it} = \alpha_{0i} + \alpha_{1i} \log Gexp_t + \alpha_{2i} \log Oil_t + \alpha_{3i} Int_t + \alpha_{4i} Inf_t + \mu_{it} \quad (3)$$

where  $i$  denotes the respective governorate. There are 6 governorates in Kuwait; the capital, Hawally, Al-Farwaniya, Al-Jahraa, Al-Ahmadi and Mubarak Al-Kabeer.

## 7. ESTIMATION

Before estimation of the determinants of house prices in Kuwait, we will analyze the properties of the panel of data employed in the study, first possible panel unit roots will be tested using different panel unit root tests, to identify whether the series of variable included are stationary in levels or in their difference form in order to identify the order of integration in these series.

Having concluded these tests panel co-integration tests will be applied using different co-integration tests in order to measure the adequacy of specifying the long term relationship between house prices and the different explanatory variables.

If the variables in the panel are found to be co-integrated or at least one co-integrating vector is identified, a vector error correction model (VECM) will be estimated to correct for deviations of the short run relationships from their long run values, hence eliminating short run disequilibria. Co-integration implies that at least one of the variables of the panel is Granger cause the others, for this reason the final step in estimation is to apply Granger causality test to the panel to determine the causality relationships.

### 7.1 Unit Root Tests

To test for unit root in the series of the panel, four different testes are conducted, the null hypothesis for the first two tests is the existence of a unit root, assuming the cross-sectional units share a common unit root process. The second two tests' null hypothesis is the existence of unit root with the assumption that the cross sectional units have individual unit root process. These tests are Levin, Lin & Chu, Im, Pesaran and Shin W-stat, ADF - Fisher Chi-square, and PP - Fisher Chi-square tests. Results of the four different tests with individual intercept and no trend conducted on the series at level are displayed below in table (6). It is clear that generally the series used in the panel are non-stationary in their levels, with few exceptions in the case of the price of oil and the inflation rate. The tests were repeated with intercept and a trend and a third time without the intercept or trend, results are generally the same.

Table-6. Panel unit root test results - series at levels

Test	Null Hypothesis	LLP	LGEX	LOIL	INT	INF
Levin, Lin & Chu	Unit Root	-0.71184 (0.2383)	-1.35269 (0.9119)	-5.48587 (0.0000)*	-1.65782 (0.9513)	-6.88909 (0.0000)*
Im, Pesaran and Shin W-stat	Unit Root	-0.60650 (0.7279)	-0.84464 (0.8008)	-3.87110 (0.0001)*	-2.22227 (0.9869)	-6.54795 (0.0000)*
ADF - Fisher Chi-square	Unit Root	10.0127 (0.6148)	4.34647 (0.9763)	35.8397 (0.0003)*	2.28065 (0.9988)	62.2632 (0.0000)*
PP - Fisher Chi-square	Unit Root	9.81770 (0.6320)	58.2015 (0.0000)*	18.9354 (0.0901)	4.96647 (0.9591)	61.8420 (0.0000)*

Notes: \* denotes significance at the 1% level and \*\* at the 5% level

If the series in the panel is found to have a unit root in their level, they require differencing to arrive at stationarity, which is a prerequisite for conducting co-integration tests. The unit root test results after first differencing are displayed below in table (7) (specification of the test is with individual intercept and no trend). According to these results the null hypothesis of unit root can be firmly rejected at the 1% significance level, which indicate that all of the five series are stationary after first differencing and are integrated of order 1 for the panel. These results are also confirmed using test specifications with intercept and a trend, and none). This indicates that the tested series are stationary after first differencing. These results leads us to the next test, which is the test for co-integration.

### 7.2 Co-integration analysis

Following the identification of significant evidence that the series contain no unit root after differencing, the next step is to test for co-integration. This step is to identify whether co-integration vectors exist among the variables. In particular, the paper aims to identify whether a long-term relationship can be determined between the price of houses

and other variables. Before testing for co-integration, we need to determine the optimal lag length. Table (8) shows that different tests of optimum lag length indicate that the optimum number of lags is 3 lags.

**Table-7.** Panel unit root test results - series at first difference

Test	Null Hypothesis	LLP	LGEX	LOIL	INT	INF
Levin, Lin & Chu t*	Unit Root	-16.2444 (0.00)*	-13.4727 (0.00)*	-12.1369 (0.00)*	-20.7607 (0.00)*	-5.25929 (0.40)
Im, Pesaran and Shin W-stat	Unit Root	-17.3626 (0.00)*	-18.0674 (0.00)*	-10.0577 (0.00)*	-18.2605 (0.00)*	-5.52439 (0.00)*
ADF - Fisher Chi-square	Unit Root	178.658 (0.00)*	186.292 (0.00)*	103.940 (0.00)*	186.742 (0.00)*	51.2160 (0.00)*
PP - Fisher Chi-square	Unit Root	189.739 (0.00)*	110.524 (0.00)*	94.5777 (0.00)*	204.027 (0.00)*	55.5693 (0.00)*

Note: \* denotes significance at the 1% level

**Table-8.** Lag Order Selection Criteria

Lag	LR	FPE	AIC	SC	HQ
0	NA	0.001026	7.307143	7.397920	7.343968
1	1247.018	8.17e-07	0.171775	0.716440	0.392725
2	297.1217	1.76e-07	-1.363701	-0.365149	-0.958627
3	248.4516*	4.88e-08*	-2.648823*	-1.196384*	-2.059625*

Included observations: 174.

\* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Based on the approaches of Pedroni, Kao and Maddala and Wu panel co-integration tests, the null hypothesis of no co-integration will be tested using the lag length of 3.

**Table-9.** Pedroni (1999) panel cointegration test results

Within dimension	Test Static	Between dimension	Test Static
Panel v-Statistic	-0.268596 (0.6059)	Group rho-Statistic	-1.283740 (0.0996)
Panel rho-Statistic	-2.283679 (0.0112)**	Group PP-Statistic	-5.450779 (0.0000)*
Panel PP-Statistic	-5.603693 (0.0000)*	Group ADF-Statistic	-4.408139 (0.0000)*
Panel ADF-Statistic	-5.074185 (0.0000)*		

Note: \* Indicates null hypothesis rejection at the 1% significance level and \*\* at the 5% level.

Notes: - The null hypothesis is that there is no cointegration.

Tables (8), (9) and (10) report the results from the three panel co-integration tests used. Pedroni (1999) panel co-integration test results indicate that in general the null hypothesis of no co-integration can be rejected. Also the Kao and Maddala and Wu test results provide evidence of co-integration in the model. More precisely, the Kao test results show that there is a long run equilibrium relationship between the series where the null hypothesis of no co-

integration is rejected at the 1% level. Similarly, the Maddala and Wu test results indicate the presence of co-integration between the five variables, where the null hypothesis of no co-integration ( $r = 0$ ) can be firmly rejected at the 1% significance level. The test results suggests that the null hypothesis of the presence of at most three unique co-integrating vectors ( $r \leq 3$ ) cannot be rejected. Therefore, there is some evidence supporting the hypothesis of the existence of unique co-integrating vectors among the tested variables.

Table-10. Kao (1999) residual cointegration test result

Null Hypothesis: No cointegration	Test Statistic	Probability
ADF	-4.046401	0.00*
Residual variance	0.009093	
HAC variance	0.003677	

Note: \* indicates hypothesis rejection at the 1% significance level.

Table- 10. Fisher panel cointegration test results

No. of CE(s)	(from trace test)	Prob.	(from max-eigen test)	Prob.
None	159.6	0.0000*	80.63	0.0000*
At most 1	93.72	0.0000*	67.62	0.0000*
At most 2	39.08	0.0001*	31.26	0.0018*
At most 3	18.36	0.1052	20.76	0.0541
At most 4	6.350	0.8974	6.350	0.8974

### 7.3 Impulse Response Functions

Having tested for co-integration, the dynamic relationship between the variables in the panel can be analyzed using impulse response functions. Generalized impulse responses were used to avoid the ordering problem of orthogonalized impulse responses. The impulse responses are shown in table (11), as it is clear from the table, the effect on one standard deviation shock in the price of houses, is generally positive, which means that higher price of houses feeds the expectations about rising future prices, this increases the demand for houses, thus leading to more pressures on house prices to rise.

The effect of one standard deviation shock in the price of oil is found to be generally in line with expected impact of higher prices of oil in oil based economies such as Kuwait. Higher prices of oil generally lead to higher housing prices as it is assumed by the model earlier. One standard deviation shock of government expenditures is found to have a positive impact on the price of houses as postulated before. Government expenditures in oil based economies generally represent the bulk of aggregate expenditures in the economy, leading thus to higher prices of assets, on top of them are houses. As expected earlier higher inflation rates increase the price of assets, among them houses, it is expected that real assets experience price expectations, the higher the inflation rate, the higher is the price of real estates, of course the scale of response of housing prices to inflation rates may not be one to one, this will depend on several factors including intensity of demand, housing supply, market conditions, and expectations. Finally, the results indicate that a one standard deviation shock in interest rates is generally causing higher housing prices. This may be explained using the fact that interest rates represent the cost of borrowing. Higher interest rates could have a positive and a negative impact on prices, in one side, an increase in interest rates would affect the demand for houses negatively, as the demand for houses would be lower and this is expected to affect the direction of house prices downward. On the other hand, the increasing cost of borrowing is expected to have upward pressures on prices as it increases the opportunity cost of owning real estates. As mentioned above, and in the case of Kuwait, we don't expect to have a negative impact of interest on the price of houses, as the government provides each citizen an interest free loan of up to US 250,000 to finance buying houses.

**Table-11.** Response of the price of houses to one standard deviation shocks of respective variables.

Period	P	OILP	GEX	INT	INF
1	0.068011	0.000000	0.000000	0.000000	0.000000
2	0.043379	0.007643	0.005476	0.004296	-0.000446
3	0.045377	-0.003469	0.001351	0.006222	0.013855
4	0.049209	0.006186	0.009488	0.008114	0.005241
5	0.048593	-0.000183	0.005993	0.005219	0.005705
6	0.048883	0.004994	0.009995	0.011756	0.003287
7	0.049291	0.002954	0.006985	0.009406	0.002448
8	0.047627	0.004433	0.006364	0.009536	0.002380
9	0.048482	0.004144	0.004436	0.008635	0.003080
10	0.047275	0.004575	0.004416	0.008200	0.004727

#### 7.4 Variance Decomposition

In order to quantitatively determine the importance of different variables on the housing prices, we use variance decomposition, which aims at decomposing the total variance of housing prices and determine how much of the variance is attributed to each of these variables. The response of housing prices to one-standard deviation shock in each variable is given up to 10 quarters in table (12).

**Table-12.** Variance decomposition up to 10 Quarters

Period	S.E.	P	OILP	GEX	INT	INF
1	0.068011	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.081328	98.38152	0.883205	0.453289	0.278983	0.003004
3	0.094435	96.05751	0.790019	0.356654	0.640980	2.154842
4	0.107522	95.04215	0.940402	1.053785	1.063876	1.899782
5	0.118398	95.22819	0.775812	1.125289	1.071724	1.798981
6	0.129157	94.34840	0.801458	1.544529	1.729098	1.576513
7	0.138791	94.31684	0.739358	1.590818	1.956646	1.396343
8	0.147269	94.22956	0.747310	1.599697	2.157114	1.266322
9	0.155434	94.31937	0.741949	1.517518	2.245113	1.176052
10	0.162864	94.33567	0.754701	1.455741	2.298448	1.155443

As is clear from the table, most of the forecast error variance in the housing prices is explained by its own innovations. Other variables have a lower explanation power, for example, the table indicates that at all levels up to 10 quarters, 94.3% of the forecast error variance in housing prices is explained by house price itself, whereas, only 2.3%, 1.6%, 1.5% and 0.8% are explained by Interest rates, inflation rates, government expenditures, and price of oil respectively.

#### 8. CONCLUSIONS AND POLICY RECOMMENDATIONS

The main purpose of this paper is to investigate the main determinants of house prices in the oil-based economy of Kuwait, where the government plays a very important role in the provision of basic population needs, on top of them is housing. The paper shows that the failure of the government to provide a solution to the long queues for housing service was reflected in accumulating pressures in the housing market as evidenced by land and house price spikes. Kuwait is among the countries in the world where house affordability is very hard. Globally, Kuwait is ranked second in terms of difficulty of buying a house for Kuwaiti families. The model of the determinants of house prices includes four variables including the price of oil, government expenditures, interest rates, and inflation rates. Results indicate that these variables are important determinants of house prices in Kuwait. However, variance decomposition tests show that 94.3% of the forecast error variance in housing prices is explained by house price itself, whereas, only 2.3%, 1.6%, 1.5% and 0.8% are explained by Interest rates, inflation rates, government expenditures, and price of oil respectively. This important result shows the important role played by the own price of houses, where demand for

houses tends to increase as their prices go up. The main conclusion of the study is that controlling the price of houses is essential in the housing market in Kuwait. Since the government is monopolizing land, this monopoly will create more pressure on housing prices. For this reason, the control of upward prices requires relaxing the state monopoly over the land. The government should also involve the private sector to come up with housing solutions to raise the supply of houses in the private housing market in order to release some of the pressures on prices

Funding: This study received no specific financial support.

Competing Interests: The authors declare that they have no competing interests.

Contributors/Acknowledgement: All authors contributed equally to the conception and design of the study.

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