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# Volatility of Oil Prices and Public Spending in Saudi Arabia: Sensitivity and Trend Analysis

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**ABSTRACT**

The export of petroleum products is the base avenue and constitutes a major ingredient of the Saudi economy. It is evident that the oil prices gradually decrease year by year governed by some international uncontrollable factors. The study is based on the secondary data obtained from the website of the Saudi Arabian Monetary Authority (SAMA). The study applies the Co-efficient of variation (CV), chain based ($I_{CB}$) and fixed based ($I_{FB}$) index numbers, correlation, and line diagram to get variability, movement, co-movement, and sensitivity and trends of the oil prices and dependent public spending avenues. The study reveals that the Saudi government enhances the level of their public spending while the oil prices lowering year by year. There is low positive sensitivity between oil prices and public spending while a negative trend between oil prices and public spending in long run. The shocks of the oil prices affect the public spending maintaining a certain gap between the growth's trends between of public spending and oil prices progressive order in long run. The trend reveals that the Saudi government basically focuses on education, health, and other community and social services while least on social security & welfare, and housing and community amenities services.

**Keywords:** Oil prices, Public Spending, Sensitivity, Trend Analysis, Saudi Arabia
**JEL Classifications:** Q40, Q41, I10, I20, I30

## 1. INTRODUCTION

In Saudi Arabia, revenues from petroleum resources are the main source of income and contribute abundantly to the GDP of Saudi Arabia. Saudi Arabia is the biggest exporter of petroleum products in the world (Investopedia, 2020). Saudi Arabia's petroleum reserves 17% of the proven reserves of the world and the oil and gas sector constitutes 50% of the Saudi GDP which accounts for 70% of the total export's revenue (Organization of the Petroleum Exporting Countries, 2020). The total revenue of petroleum products depends on the price and demand for oil in the international market. The prices of the products are governed by the demand of the products while some international uncontrollable factors affect the demand of the product internationally. The prices of oil products start to decline from 2014 gradually year by year. Recently, oil prices start increasing but could not achieve their

level of 2013 or before. The oil prices affect government spending as the oil prices contribute to the Saudi economy to a larger extent and forced the government to impose new taxes (Alharbi, 2020).

The major portion of the economic activities backed by the revenues from the oil exports so the fluctuations in the oil prices affect the Saudi economy (Sultan and Haque, 2018). Public spending of the government reveals the government's approach towards the development and growth and wellbeing of inhabitants of the nation. It is evident that the international prices of the oil products start decreasing from 2014 that affects the total revenues of the countries relying on the export of the oil products. However, Saudi Arabia enhances its public spending on education, health, social security, housing, and other services to attain the goals of the vision 2030 in long term. So, there is a need to explore the impacts of oil price changes on the various ingredients of public

spending and develop the pattern and trend in the short and long run. The study also explains the priorities of the government by absolute weightage on public spending even the oil price decrease, internationally.

## 2. LITERATURE REVIEW

Bodea et al. (2016) conducted a study of exploring the conditions which can lower the huge conflict related to the oil wealth. They found that the effect of the oil on the civil spending is the matter of expenditures allocated to the military and government services. They utilized the logit models and used 148 countries data from 1960 to 2009 to test the mitigation effect on the public spending of oil and civil effect and found that there is a high degree association between the spending on military and oil and gas prosperity of the nation. The countries whose oil and gas resources low create conflicts while enhancing the military spending suggested enhancing the spending on public services instead of spending on the military. Su et al. (2019) conducted a study on the relationship of geopolitical risk, oil prices, and financial liquidity position to support the monetary equilibrium model in Saudi Arabia. They discovered that oil prices and financial liquidity correlated as per the time span while the geopolitical risk is high and assumed the monetary equilibrium model. They suggested the diversification of resource income to minimize the reliability of oil prices. Al-Maamary et al. (2017) studied the impact of oil price fluctuations on the common renewable energies i.e. solar, wind sources, nuclear power, and hydrogen fuel cells, etc., in GCC countries and found that renewable sources may be an option in the future. They explored that in past decades the development of the GCC countries was based on the demand for energy. They explained that resource efficiency programs, alternative energy projects, green economy strategies, clean technology research, green building codes, and public transport systems have become debatable issues as an option of traditional sources of energy, nowadays.

Vohra (2017) carried out a study impact of oil prices on GCC economies and explored that the GCC countries' economy based on the export of oil products. He finds that decreasing prices of the oil governs the current account of the nation, negatively. Alodadi and Benhin (2015) studied the long-term economic growth and role of the non-oil sector in Saudi Arabia and discovered oil as a source of economic growth but not appropriate for the sustainable development of the economy. They applied the Johansen approach and error correction modeling and used government spending, exports, religious tourism, private and public investment, labor, and capital as independent variables and economic growth as a dependent variable and found that the all the variables important in the growth of Saudi economy except the non-oil sector. Indirectly, the oil sector contributes to enhancing the economic growth of Saudi Arabia. Al-Qudair (2005) carried out a study of the relationship between Government Expenditure and Revenues in the Kingdom of Saudi Arabia and found a long term equilibrium relationship. Also, the causality test explores the bi-directional relations between government expenditure and revenues in Saudi Arabia. Abdel-Latif et al. (2018) studied the impact of oil prices on government expenditures in Saudi Arabia and found that oil prices deviations affect health and education, directly.

There is a curvilinear relation between oil prices and government expenditures. The negative deviations in the oil prices significantly and positively correlated with the government compared to positive deviations in the oil prices.

Haque and Khan (2019) studied the role of the oil production and government expenditure in improving the Human Development Index (HDI) in Saudi Arabia and found that the government expenditure and exports of the oil products significantly affects the HDI. Further, they found the educational expenditures contribute HDI mostly while a negative relationship between the expenditures on health and economic growth. Mensi et al. (2018) investigated the impact of private and public investment, oil production, and inflation on non-oil GDP in Saudi Arabia. They found the negative relationship between private investment shock and non-oil GDP in long run, while there were positive inflation shocks and non-oil GDP in Saudi Arabia. Nusair (2016) examined the effect of oil price shocks on the GDP of the GCC countries and found the positive relationship between the oil price changes and the GDP. Further, he explained that the positive prices have a stronger relationship than the negative prices. Aregbeyen and Kolawole (2015) examined the relationship of Oil Revenue, Public Spending, and Economic Growth in Nigeria and found that the oil revenue governed the spending of the government and economic growth in the period 1980-2012. Also, they found no relationship between public spending and economic growth in Nigeria. They suggested that the government should invest more in capital projects to enhance oil production to contribute to the economy. Al Rasasi et al. (2019) analyzed a relationship between oil revenues and economic growth in Saudi Arabia and observed a strong and positive relationship between oil revenues and economic growth and development. In order to achieve the goals of vision 2030, the Saudi government will have to consider the development of the private and non-oil sector to scale the predetermined rate of growth and development of the economy.

Moshashai et al. (2020) considered the vision 2030 of Saudi Arabia and explained the diversification of resources to minimize the budget deficit and dependency on the oil sector by forming the appropriate budgets and policies. Hemrit and Benlagha (2018) studied the effect of government spending on the non-oil economic growth of Saudi Arabia. They explained the reason behind the selection of non-oil GDP than oil GDP that oil GDP is governed by so many international and uncontrollable factors. Based on the analysis, they explained the positive relationship between government expenditure and the growth of the non-oil GDP of Saudi Arabia. Alkhteeb et al. (2017b) carried out a study about oil revenue, public spending, GDP, and employment in Saudi Arabia and explored that oil revenue and public spending govern employment. They suggested minimizing the dependency on oil revenues to face the problems arising due to the shock of oil prices in the Saudi economy. Mahmood and Alkhteeb (2018) found that the oil prices and financial market development directly govern the foreign direct inflows (FDI) while enhancing the level of domestic investment demoralize the FDI. Alkhateeb et al. (2017a) found a positive relationship between oil prices and employment in Saudi Arabia. The increasing oil prices affect employment more than the decreasing prices in Saudi Arabia and suggested to save the oil revenue to compensate in the oil price crisis period.

Maghrebi et al. (2018) examined the causal relationship between oil prices and their effect on the GDP of Saudi Arabia and found the cointegration between the oil prices and GDP of Saudi Arabia. Mohammed et al. (2020) investigated the impact of the oil price changes on exchange rates in Saudi Arabia and found that there is the same directional movement of the oil prices and exchange rates in the short-term while in long term the casual relationship is bidirectional. Sultan and Haque (2018) found a positive relationship between economic growth and exports, and government expenditures while a negative relationship between the economic growth and imports of Saudi Arabia. Mahmood et al. (2020) explained that the urbanization and income backed by the level of oil prices in the oil-enriched countries. They found the positive relationship between the oil prices and emission of $CO_2$ in Saudi Arabia. Most of the studies reflect the mixed relationship i.e. positive and negative between the oil prices, public spending, and GDP of Saudi Arabia. There is the unavailability of the study reflects the sensitivity of changes in oil prices on the public spending of Saudi Arabia.

## 3. RESEARCH METHODOLOGY

The study is purely based upon the secondary data obtained from the website of the Saudi Arabian Monetary Authority (SAMA) for the period 2011-2018. In the co-movement analysis, oil prices are considered as the independent variable while spending on health, education, Social Security and Welfare, Housing and Community Amenities Services, and other community and Social services as dependent variables. Coefficient of Variation (CV) calculated to get abnormality in the variability of all variables. CBI or Chain based index numbers ($I_{CB}$) and FBI or fixed based index numbers ($I_{FB}$) are calculated to get the short-term and long-term movement between the dependent and independent variables.

$$I_{CB} = \frac{CYp, ps}{PYp, ps}100; \quad I_{FB} = \frac{CYp, ps}{BYp, ps}100;$$

Where, $CY_{p,ps}$ = Current year's price or public spending; $PY_{p,ps}$ =Previous year's price or public spending; and $BY_{p,ps}$ = Base year's price or public spending.

Correlation coefficient calculated between the $I_{CB}$ of dependent and independent variables to measure the short term impact or sensitivity

of oil price changes on the public spending in the short run. Also, the Correlation coefficient calculated between the $I_{FB}$ of dependent and independent variables to measure the impact of oil price changes in the long run. The line diagram explains the co-movement trend of oil prices and other public spending dependent variables.

## 4. DATA ANALYSIS AND RESULTS

The analysis to measure the volatility impact of the oil prices on government spending on health, education, Social Security and Welfare, Housing. and Community Amenities Services and other community and Social services can be divided into two categories i.e. normality of the variability and co-movement of the oil prices and other dependent variables.

### 4.1. Normality of the Variability of the Oil Prices and Other Dependents
The normality of the variability of the variables explains that variations of the variables are normal and not affected by the abnormal factors. The normality in the data facilitates the comparative study.

Table 1 explains that the normality of variability of the oil prices and other dependent variables. The variability of oil prices is more than public spending and reveals that the volatility of oil prices is more than public spending. There is a low effect of the sensitivity of volatility of oil prices on public spending.

### 4.2. Sensitivity and Co-movement of Oil Prices and Other Dependent Variables
The Co-movement of oil prices and other dependent variables explains the sensitivity and trend of oil price variations and their impact on government spending. The co-movement of $I_{CB}$ of oil prices reflects the sensitivity while the co-movement of $I_{FB}$ of oil prices and other spending reveals the variations in oil prices and its impact on public spending in long run.

#### *4.2.1. Sensitivity and co-movement of oil prices and education expenditures*
The Co-movement of oil prices and education expenditure reveals the sensitivity and trend of education expenditure due to changes in oil prices. The sensitivity of oil prices changes on the education expenditures measured by computing the correlation between the $I_{CB}$ of oil prices and education expenditure while trend explained

**Table 1: Variability of oil prices and public spending in Saudi Arabia (Million Riyals)**

| Years | Oil price-USD PER Barrel | Education exp. | Health exp. | Social Security and Welfare exp. | Housing and Community amenities services exp. | Other community and Social services exp. |
|-------|--------------------------|----------------|-------------|----------------------------------|-----------------------------------------------|------------------------------------------|
| 2011 | 107.46 | 141859 | 62663 | 2039 | 24662 | 9317 |
| 2012 | 109.45 | 159235 | 75752 | 3210 | 26075 | 10950 |
| 2013 | 105.87 | 186605 | 94479 | 4300 | 39620 | 12711 |
| 2014 | 96.29 | 199370 | 105826 | 5221 | 42531 | 15551 |
| 2015 | 49.49 | 211716 | 101059 | 4216 | 38093 | 14722 |
| 2016 | 40.76 | 189416 | 81573 | 3022 | 30219 | 11144 |
| 2017 | 52.43 | 193419 | 81512 | 3240 | 30643 | 11923 |
| 2018 | 69.78 | 222585 | 93971 | 4203 | 34737 | 14367 |
| Av. | 78.94 | 188025.63 | 87104.38 | 3681.38 | 33322.50 | 12585.63 |
| S.D. | 28.99 | 26396.91 | 14317.29 | 989.97 | 6475.84 | 2152.18 |
| cv | 36.72 | 14.04 | 16.44 | 26.89 | 19.43 | 17.10 |

Source: Author's own calculation based on data available SAMA website

by establishing the correlation between the $I_{FB}$ of oil prices and education expenditure.

From Table 2 it is clear that there is a positive but low degree correlation (0.27) between yearly fluctuations of oil prices and education expenditures of the Saudi government. This implies that the oil price changes affect education expenditure positively but not strongly or education expenditures in Saudi Arabia are low sensitive by the change in the oil price changes. In long run, oil prices and education expenditures negatively correlated or Saudi government spending on education irrespective of the oil prices. Oil prices decrease while the government's spending on education enhancing in long run.

Figure 1 explains the sensitivity and co-movement trend of oil prices and education expenditures and reveals that there is low but positive sensitivity while the co-movement trend indicates that the gap between the oil prices and the education expenditures increasing but the shocks of oil prices pull down the education expenditures enhancing the gap between the oil prices and education expenditures in Saudi Arabia.

### 4.2.2. Sensitivity and co-movement of oil prices and health expenditures
The Co-movement of oil prices and health expenditure reveals the sensitivity and trend of education expenditure due to changes in oil prices. The sensitivity of oil prices changes on the health expenditures measured by computing the correlation between the $I_{CB}$ of oil prices and health expenditure while the trend is explained

by establishing the correlation between the $I_{FB}$ of oil prices and health expenditure.

From Table 3 it is clear that there is a positive but low degree correlation (0.37) between yearly fluctuations of oil prices and health expenditures of the Saudi government. This implies that the oil prices change effect positively but not strongly or health expenditures in Saudi Arabia are low sensitive by the change in the oil price changes. In long run, oil prices and health expenditures negatively correlated (−0.21) or Saudi government spending on health irrespective of the oil prices. Oil prices decrease while the government's spending on education enhancing in long run. The sensitivity and co-movement of health expenditures reveal positive governance than education expenditure.

Figure 2 explains the sensitivity and co-movement trend of oil prices and health expenditures and reveals that there is low but positive sensitivity while the co-movement trend indicates that the gap between the oil prices and the health expenditures increasing but the shocks of oil prices pull down the education expenditures enhancing the gap between the oil prices and health expenditures in Saudi Arabia.

### 4.2.3. Sensitivity and co-movement of oil prices and social security and welfare expenditures
The Co-movement of oil prices and Social Security and Welfare expenditure reveals the sensitivity and trend of education expenditure due to changes in oil prices. The sensitivity of oil prices changes on the Social Security and Welfare expenditures

**Table 2: Co-movement of oil prices and education expenditures (Million Riyals)**

| Years | Oil price-USD PER Barrel | Education exp. | $I_{CB}$ of Oil price | $I_{CB}$ of Education exp. | $I_{FB}$ of Oil price | $I_{FB}$ of Education exp. |
|---|---|---|---|---|---|---|
| 2011 | 107.46 | 141859 | 100 | 100 | 100 | 100 |
| 2012 | 109.45 | 159235 | 101.85 | 112.25 | 101.85 | 112.25 |
| 2013 | 105.87 | 186605 | 96.73 | 117.19 | 98.52 | 131.54 |
| 2014 | 96.29 | 199370 | 90.95 | 106.84 | 89.61 | 140.54 |
| 2015 | 49.49 | 211716 | 51.40 | 106.19 | 46.05 | 149.24 |
| 2016 | 40.76 | 189416 | 82.36 | 89.47 | 37.93 | 133.52 |
| 2017 | 52.43 | 193419 | 128.63 | 102.11 | 48.79 | 136.35 |
| 2018 | 69.78 | 222585 | 133.09 | 115.08 | 64.94 | 156.91 |
| | | | | r=0.27 | | r=−0.61 |

Source: Author's own calculation based on data available SAMA website

**Figure 1: Sensitivity and co-movement trend of oil prices and education expenditures**
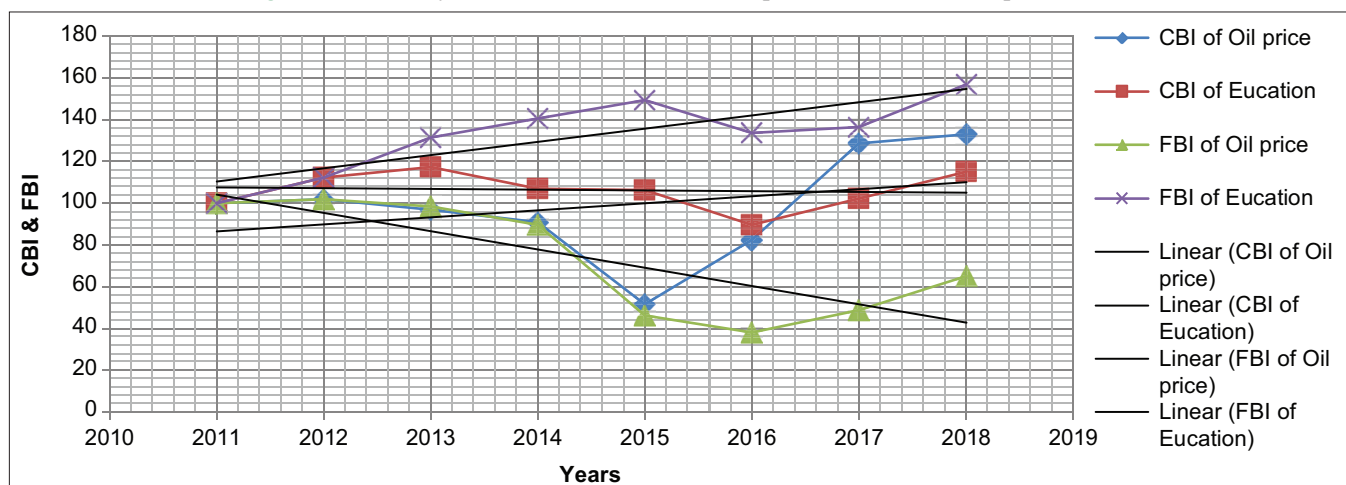


Source: Based on index numbers given in Table 2

**Table 3: Co-movement of oil prices and health expenditures (Million Riyals)**

| Years | Oil price-USD PER Barrel | Health exp. | $I_{CB}$ of Oil price | $I_{CB}$ of Health exp. | $I_{FB}$ of oil price | $I_{FB}$ of Health exp. |
|-------|--------------------------|-------------|----------------------|-------------------------|----------------------|-------------------------|
| 2011 | 107.46 | 62663 | 100.00 | 100.00 | 100.00 | 100.00 |
| 2012 | 109.45 | 75752 | 101.85 | 120.89 | 101.85 | 120.89 |
| 2013 | 105.87 | 94479 | 96.73 | 124.72 | 98.52 | 150.77 |
| 2014 | 96.29 | 105826 | 90.95 | 112.01 | 89.61 | 168.88 |
| 2015 | 49.49 | 101059 | 51.40 | 95.50 | 46.05 | 161.27 |
| 2016 | 40.76 | 81573 | 82.36 | 80.72 | 37.93 | 130.18 |
| 2017 | 52.43 | 81512 | 128.63 | 99.93 | 48.79 | 130.08 |
| 2018 | 69.78 | 93971 | 133.09 | 115.28 | 64.94 | 149.96 |
| | | | r=0.37 | | r=−0.21 | |

Source: Author's own calculation based on data available SAMA website

**Figure 2:** Sensitivity and co-movement trend of oil prices and health expenditures
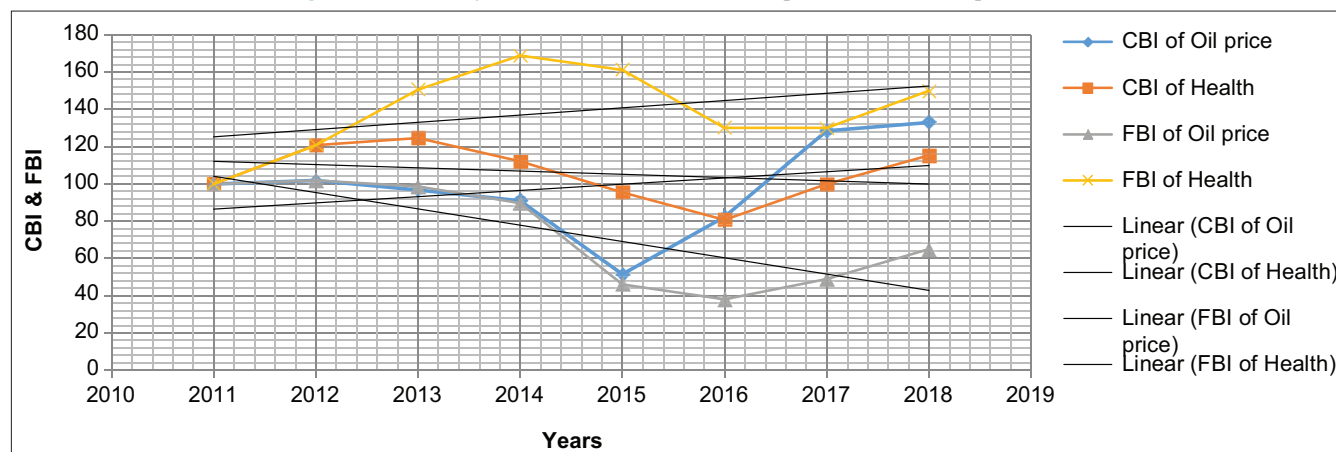


Source: Based on index numbers given in Table 3

measured by computing the correlation between the $I_{CB}$ of oil prices and Social Security and Welfare expenditure while the trend is explained by establishing the correlation between the oil $I_{FB}$ prices and Social Security and Welfare expenditure.

From Table 4 it is clear that there is a positive but moderate correlation (0.51) between yearly fluctuations of oil prices and Social Security and Welfare expenditures of the Saudi government. This implies that the oil price changes affect positively but not so strong or Social Security and Welfare expenditures in Saudi Arabia are moderately sensitive by the change in the oil price changes. In the long run, oil prices and Social Security and Welfare expenditures low degree negatively correlated (−0.0075) or Saudi government spending on Social Security and Welfare irrespective of the oil prices comparatively education and health. Oil prices decrease while the Saudi government's spending on education enhancing in long run. The sensitivity and co-movement of Social Security and Welfare expenditures reveal positive governance than health and education.

Figure 3 explains the sensitivity and co-movement trend of oil prices and Social Security and Welfare expenditures and reveals that there is moderate and positive sensitivity while the co-movement trend indicates that the gap between the oil prices and the Social Security and Welfare expenditures increasing but the shocks of oil prices pull down the Social Security and Welfare expenditures enhancing the gap between the oil prices and Social Security and Welfare expenditures in Saudi Arabia.

### 4.2.4. Sensitivity and co-movement of oil prices and housing and community amenities services expenditures

Co-movement of oil prices and Housing and Community Amenities Services expenditure reveals the sensitivity and trend of education expenditure due to change in the oil prices. The sensitivity of oil prices changes on the Housing and Community Amenities Services expenditures measured by computing the correlation between the $I_{CB}$ of oil prices and Housing and Community Amenities Services expenditure while the trend is explained by establishing the correlation between the $_{IFB}$ of oil prices and Housing & Community Amenities Services expenditure.

From Table 5 it is clear that there is a positive but low degree correlation (0.32) between yearly fluctuations of oil prices and Housing and Community Amenities Services expenditures of the Saudi government. This implies that the oil price changes affect positively but not strongly or Housing and Community Amenities Services expenditures in Saudi Arabia is low sensitive by the change in the oil price changes. In the long run, oil prices and Housing and Community Amenities Services expenditures low degree and negatively correlated (−0.08) or Saudi government spending on the Housing & Community Amenities Services irrespective of the oil prices. Oil prices decrease while the government's spending on education enhancing in long run. The sensitivity and co-movement of Housing and Community Amenities Services expenditures reveal positive governance than health and education expenditure.

**Table 4: Co-movement of oil prices and Social Security and Welfare expenditures (Million Riyals)**

| Years | Oil price-USD PER Barrel | Social Security and Welfare exp. | $I_{CB}$ of oil price | $I_{CB}$ of soc. Secu. and Wel.exp. | $I_{FB}$ of oil price | $I_{FB}$ of soc. Secu. and Wel. Exp. |
|---|---|---|---|---|---|---|
| 2011 | 107.46 | 2039 | 100 | 100 | 100 | 100 |
| 2012 | 109.45 | 3210 | 101.85 | 157.43 | 101.85 | 157.43 |
| 2013 | 105.87 | 4300 | 96.73 | 133.96 | 98.52 | 210.89 |
| 2014 | 96.29 | 5221 | 90.95 | 121.42 | 89.61 | 256.06 |
| 2015 | 49.49 | 4216 | 51.40 | 80.75 | 46.05 | 206.77 |
| 2016 | 40.76 | 3022 | 82.36 | 71.68 | 37.93 | 148.21 |
| 2017 | 52.43 | 3240 | 128.63 | 107.21 | 48.79 | 158.90 |
| 2018 | 69.78 | 4203 | 133.09 | 129.72 | 64.94 | 206.13 |
| | | | r=0.51 | | r=−0.0075 | |

Source: Author's own calculation based on data available SAMA website

**Table 5: Co-movement of oil prices and Housing and Community Amenities Services expenditures (Million Riyals)**

| Years | Oil price-USD PER Barrel | Hou. and Communi. Amini. Serv. exp. | $I_{CB}$ of oil price | $I_{CB}$ of Hou. and Communi. Amini. Serv. exp. | $I_{FB}$ of Oil price | $I_{FB}$ of Hou. and Communi. Amini. Serv. exp. |
|---|---|---|---|---|---|---|
| 2011 | 107.46 | 24662 | 100 | 100 | 100 | 100 |
| 2012 | 109.45 | 26075 | 101.85 | 105.73 | 101.85 | 105.73 |
| 2013 | 105.87 | 39620 | 96.73 | 151.95 | 98.52 | 160.65 |
| 2014 | 96.29 | 42531 | 90.95 | 107.35 | 89.61 | 172.46 |
| 2015 | 49.49 | 38093 | 51.40 | 89.57 | 46.05 | 154.46 |
| 2016 | 40.76 | 30219 | 82.36 | 79.33 | 37.93 | 122.53 |
| 2017 | 52.43 | 30643 | 128.63 | 101.40 | 48.79 | 124.25 |
| 2018 | 69.78 | 34737 | 133.09 | 113.36 | 64.94 | 140.85 |
| | | | r=0.32 | | r=−0.08 | |

Source: Author's own calculation based on data available SAMA website

**Figure 3:** Sensitivity and co-movement trend of oil prices and social security and welfare expenditures
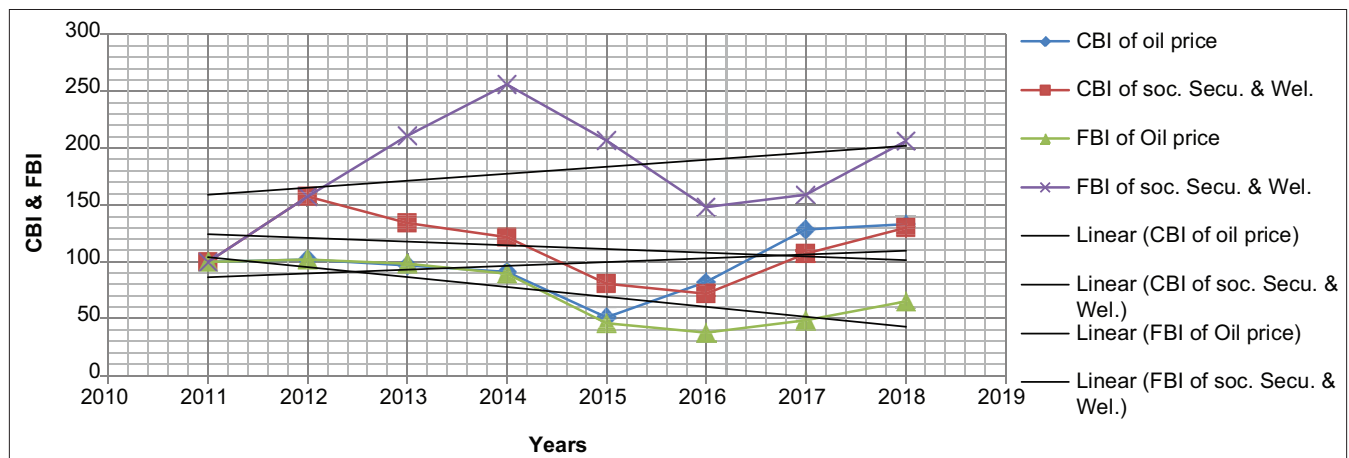


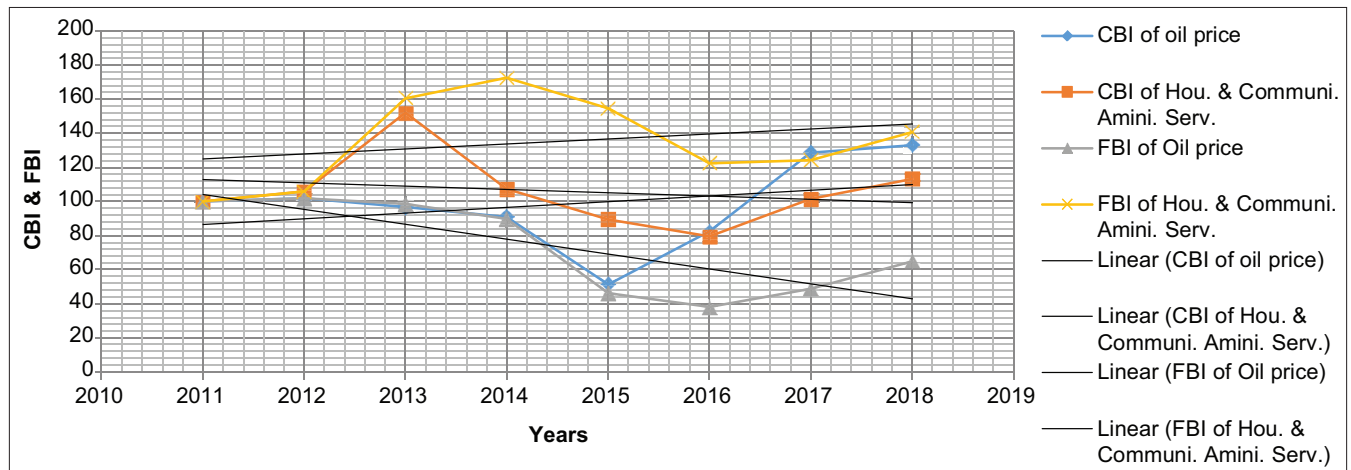Source: Based on index numbers given in Table 4

Figure 4 explains the sensitivity and co-movement trend of oil prices and Housing and Community Amenities Services expenditures and reveals that there is low and positive sensitivity while the co-movement trend indicates that the gap between the oil prices and the Housing and Community Amenities Services expenditures increasing but the shocks of oil prices pull down the Housing and Community Amenities Services expenditures enhancing the gap between the oil prices and Housing and Community Amenities Services expenditures in Saudi Arabia.

### 4.2.5. Sensitivity and co-movement of oil prices and other community and Social services expenditures
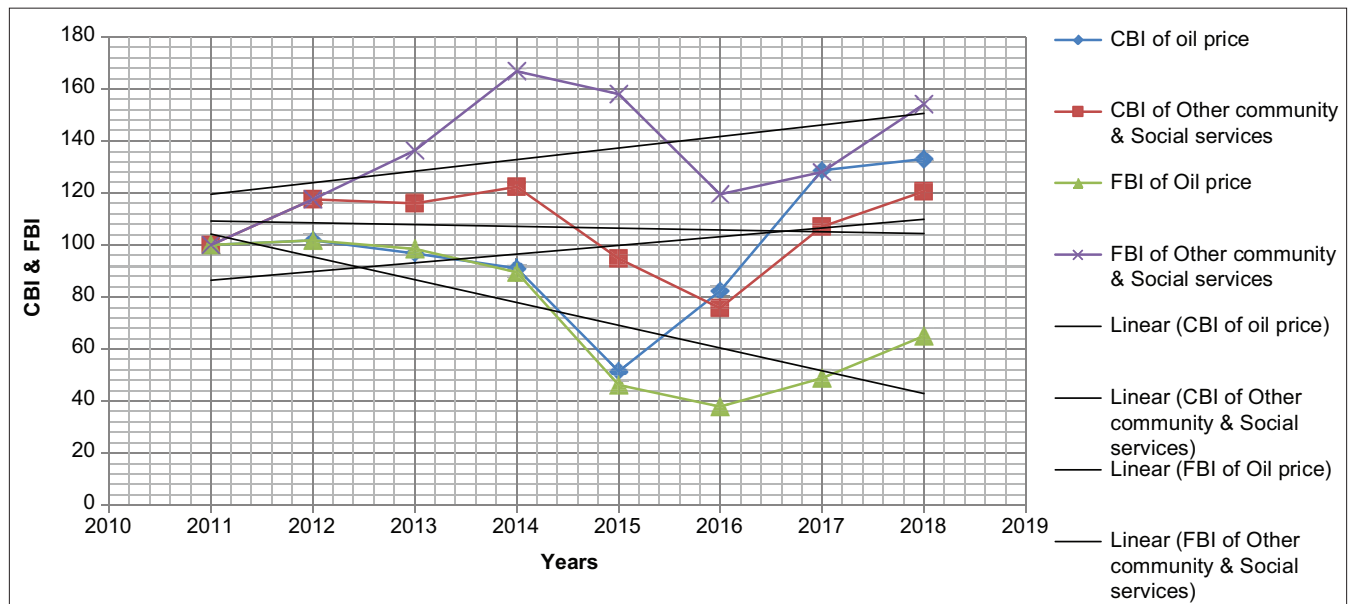Co-movement of oil prices and other community and Social services expenditure reveals the sensitivity and trend of other

community and Social services expenditure due to change in the oil prices. The sensitivity of oil prices changes on the other community and Social services expenditures measured by computing the correlation between the $I_{CB}$ of oil prices and other community and Social services expenditure while trend explained by establishing the correlation between the of $I_{FB}$ oil prices and other community and Social services expenditure.

From Table 6 it is clear that there is a positive and moderate degree correlation (0.50) between yearly fluctuations of oil prices and other community and Social services expenditures of the Saudi government. This implies that the oil price changes affect positively but not so strong or other community and Social services expenditures in Saudi Arabia are moderately sensitive by the change in the oil price

**Figure 4:** Sensitivity and co-movement trend of oil prices and housing and community amenities services expenditure



Source: Based on index numbers given in Table 5

**Figure 5:** Sensitivity and co-movement trend of oil prices and other community and services expenditure



Source: Based on index numbers given in Table 6

**Table 6: Co-movement of oil prices and other community and social services expenditures (Million Riyals)**

| Years | Oil price-USD PER Barrel | Other community and Social services exp. | $I_{CB}$ of oil price | $I_{CB}$ of Other community and Social services exp. | $I_{FB}$ of Oil price | $I_{FB}$ of Other community and Social services exp. |
|---|---|---|---|---|---|---|
| 2011 | 107.46 | 9317 | 100 | 100 | 100 | 100 |
| 2012 | 109.45 | 10950 | 101.85 | 117.53 | 101.85 | 117.53 |
| 2013 | 105.87 | 12711 | 96.73 | 116.08 | 98.52 | 136.43 |
| 2014 | 96.29 | 15551 | 90.95 | 122.34 | 89.61 | 166.91 |
| 2015 | 49.49 | 14722 | 51.40 | 94.67 | 46.05 | 158.01 |
| 2016 | 40.76 | 11144 | 82.36 | 75.70 | 37.93 | 119.61 |
| 2017 | 52.43 | 11923 | 128.63 | 106.99 | 48.79 | 127.97 |
| 2018 | 69.78 | 14367 | 133.09 | 120.50 | 64.94 | 154.20 |
| | | | r=0.50 | | r=−0.22 | |

Source: Author's own calculation based on data available SAMA website

changes. In the long run, oil prices and other community and Social services expenditures low degree and negatively correlated (−0.22) or Saudi government spending on the other community and Social services irrespective of the oil prices. Oil prices decrease while the government's spending on education enhancing in long run. The sensitivity and co-movement of other community and Social services expenditures reveal positive governance than the health, education, and housing and community amenities services.

Figure 5 explains the sensitivity and co-movement trend of oil prices and other community and Social services expenditures and reveals that there is low and positive sensitivity while the co-movement trend indicates that the gap between the oil prices and the other community and Social services expenditures increasing but the shocks of oil prices pull down the other community and Social services expenditures enhancing the gap between the oil prices and other community and Social services expenditures in Saudi Arabia.

## 5. CONCLUSIONS AND IMPLICATIONS

Based on sensitivity, co-movement and trend analysis of the oil prices variations and public spending on the education, health, Social Security and Welfare, Housing and Community Amenities Services, other community and Social services explains the low degree the positive yearly impact of oil price changes on the public spending while there is negativity in long run. There are a very low degree and positivity sensitivity impact of the changes in oil prices on public spending in Saudi Arabia. In the long-term, public spending of the Saudi Arabian government on education, health, Social Security and Welfare, Housing and Community Amenities. Services, other community and Social services increase irrespective of the lowering the oil prices. Individual study of each avenue of public spending reveals that the Social Security and Welfare, other community and Social services moderately sensitive by the changes in oil prices while education, health, and housing communities and amenities services sensitive negligibly by the prices fluctuations of oil.

In long term, the Saudi government enhances spending on education while lowering the prices of oil. However, the Saudi government enhances public spending but lower than the expenditures on education in long run, proportionately. The trend analysis reveals that oil prices lowering since 2011 while the public spending affected by the shocks of the oil prices maintaining a certain gap between the growth's trend in progressive order. The trend reveals that the Saudi government basically focuses on education, and health, and other community and social services while least social security and welfare, and housing and community amenities services.

The Saudi government should invest more in capital projects to enhance oil production to contribute to the economy as the oil price is governed by international demand and uncontrollable factors. Surely, diversification of the income sources to face the crisis of low oil prices is necessary for Saudi Arabia.

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