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Analysing the Determinants of Public Expenditure in the United Arab Emirates (UAE): Evidence from ARDL Bounds Testing Approach

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Abstract: This study examines the determinants of public expenditure in the UAE between 1975 and 2020, using the Gregory-Hansen cointegration and ARDL bounds testing approaches. The results confirm that cointegrating (long-run) relationship exist between public expenditure and the selected macroeconomic variables (oil price, tax burden, fiscal deficit, outflow of money, FDI outflow and interest rate), with a structural break in 1989. In addition, the results reveal that public expenditure in the UAE is determined by oil price, tax burden, fiscal deficit, outflow of money, FDI outflow, and interest rate both in the short- and long-run. Based on these outcomes, the diversification of UAE's public revenue, reduction of fiscal deficit, the elimination of unofficial remittance channels, implementation of investor-friendly trade policies, and interest rate stabilization are recommended, while strict monitoring of tax collection and blockage of tax leakages are advanced.

JEL Classification: H50; H26; H62; F24; C22
Keywords: Public expenditure, structural break, Gregory-Hansen cointegration, ARDL bounds testing, the UAE.

1. Introduction

For several decades, especially after the World War II, the growth phenomenon of public expenditure has been a subject of research. This is not unconnected to the shift in state's traditional functions of providing defence, law and order, and social overhead, to direct involvement in economic activities, which thus led to the rapid expansion in public expenditure in many countries, developed and developing alike (Aregbeyen & Akpan, 2013).

Like in most countries, public expenditure in the United Arab Emirate (UAE)– federation of seven emirates: Abu Dhabi, Ajman, Dubai, Fujairah, Ras Al Khaimah, Sharjah and Umm Al Quwain–has been expanding both in absolute and relative terms since the country gained independence in 1971 (Mestareehih, 2017). Though as a share of the GDP, public expenditure in the UAE is the least in comparison with other countries in the Gulf Cooperation Council (GCC) region (made up of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE) (World Bank, 2021). Nevertheless, it is recognized that the country's public expenditure growth is the major catalyst in the transformation of the country's poor economy, which was hitherto based on fishing, seafaring and pearl trade, to the second largest in the Arab world, just behind Saudi Arabia (Katsaiti, Ahmad, Tajuddin & Abdulrouf, 2017).

While this is not unconnected to the argument that, as the 'wheels' – if not the engine – of economic activities, larger public expenditure, particularly on health, education, and public infrastructure, tends to increase growth, which further improves social welfare and ensure poverty alleviation (Shonchoy, 2010). However, it is alleged that "excessive expansion of public expenditure is the cause of many economic ills such as slow economic growth, large public deficits, and internal and external imbalances" (Ukwueze, 2015). Hence, it is important to understand the factors responsible for the expansion or otherwise of public expenditure, since it not only aid effective manipulation and management of fiscal imbalances, but also ensure the attainment of the desired goals and the encouragement of stability in the economy (Jibir & Aluthge, 2019).

While studies have linked movement in public expenditure to several factors, including income, corruption, trade openness, foreign aid, inflation, debt burden, market size, ethnic diversity, population growth and urbanisation, wars and political instability, and so on (see Aregbeyen & Akpan, 2013; Jibir & Aluthge, 2019; Kamaly, El-Said & Saleh, 2017; Mauro, 1998; Okafor & Eiya, 2011; Shonchoy, 2010; Ukwueze, 2015; Wagner, 1883). However, due to mixed results and the profound divergence in the spending profiles and priorities across countries, there exist no generally agreed or a-one-size-fit-all justifications for public expenditure dynamics (Aregbeyen & Akpan, 2013). Thus, this suggest that the determinants of public expenditure are country-dependent.

Nonetheless, for a country such as the UAE, the trend and magnitude of oil price, tax burden, fiscal deficit, outflow of money, FDI outflow and interest rate in the country suggest that they may have, directly or indirectly, contributed to the expansion of public expenditure in the country. For instance, as an oil-dependent country, uncertainty about future oil revenues and the variability of such revenues resulting from oil price shocks may be responsible for changes in public expenditure as the government reassesses its expected revenue stream (Abdel-Latif, Osman & Ahmed, 2018). Also, tax burden in the country which is low due to dependence on oil revenue and tax evasion practices could have affected expenditure through its direct effect on revenue (Edrees, 2016; Lundberg, 2017).

In addition, through changes in consumption, savings and investment, public expenditure in the UAE could have been influenced by the low interest rate and the huge outflow of money from the country, which is the consequence of heavy reliance on foreign labour (Choi & Devereux, 2006; Hathroubi&Aloui, 2016; Naufal & Genc, 2012; Naufal &Vargas-Silva, 2010; Taghavi, 2012). Moreover, the sustained rise in FDI outflow could also have influenced public expenditure by changing the levels of employment, productivity and output growth (Ameer, Xu & Alotaish, 2017; Masso, Varblane &Vahte, 2008). However, the persistent

fiscal deficit in the country, which is due to the low tax revenue and fluctuating oil price, may also have compelled public expenditure expansion through fiscal illusion on the part of the citizens (Moore, Buchanan & Wagner, 1979; Jaén-García, 2016). Regardless, whether these factors could be rightly held responsible for changes in UAE's public expenditure remains an empirical question.

Despite the expansion and importance of public expenditure in the country, researchers have paid little attention to its dynamics and the factors which influence its movement. Moreover, though studies on the influence of oil price, tax burden, fiscal policy, outflow of money, FDI outflow and interest rate on public expenditure are relatively sparse, most are either from a cross-country perspective or entirely outside of the UAE (see Abdel-Latif et al.,2018; Aladejare, 2020; Jaén-García, 2016; Mourad &Hadadah, 2019; Taghavi, 2012). However, it is difficult make draw a definite conclusion on what actually dictate the pattern of UAE's public expenditure on the ground of these studies seeing that the extent of economic diversification, and spending profile and priorities across these countries differs. Besides, most of the cross-country studies which incorporated the UAE data are deficient in some way, including the use of small samples, inclusion of non-stationary series, and the exclusion of important post-estimation diagnostic tests (see Cockx & Francken, 2015; Doğan, 2017; Kamaly et al., 2017).

Therefore, this study is significant in many aspects. For one, it is the first and explicit attempt, to the best of our knowledge, to provide a thorough empirical explanation to the determinants of public expenditure in the UAE. Also, this study adopts robust estimation techniques such as the Gregory-Hansen cointegration in and the autoregressive distributed lag (ARDL) bounds testing technique. In addition, important post-estimation diagnostics, such as the auto-correlation, stability and heteroscedasticity tests, which was not conducted in the previous studies are performed to verify the dependability of the results generated. Moreover, by extending the study period (1975-2020), this study is unique and have an edge over previous studies, as the sample is large and robust enough to provide fresh insights into the dynamics of UAE's public expenditure.

Following the introductory part, the other parts of this paper is structured as follows. Relevant empirical studies are reviewed in section two, whereas theoretical framework, model formulation, data and econometric techniques are addressed in section three. In the fourth section, results are presented and discussed, and the last section is dedicated to conclusion and recommendations.

2. Review of Relevant Empirical Studies

Despite the growing literature of public expenditure, studies on the factors which drive UAE's public expenditure are relatively scarce. Most of the accessible studies are cross-sectional in nature, with countries in the GCC, Arab world or MENA (Middle East and North Africa) region being pooled together, with the inclusion of the UAE. For instance, Mourad and Hadadah (2019) studies the oil price, public expenditure and economic growth interrelationship in the GCC region between 1965 and 2015, adopting the ARDL bounds testing approach. The results confirm that output growth is an increasing function of public expenditure in the 6 countries. Further evidence suggests that oil price reduces public expenditure in Saudi

Arabia, Oman and Qatar, and increase public expenditure in the UAE, Kuwait and Bahrain. Also, in evaluating the determinants of public health expenditure in 10 MENA countries (Bahrain, Kuwait, Iran, Iraq, UAE, Israel, Lebanon, Saudi Arabia, Egypt and Turkey), Doğan (2017) used the generalised method of the moments (GMM) dynamic system and Granger causality technique during the 1995–2014 period. The results indicate that exchange rate is a significant driving force of public health expenditure in the countries.

Similarly, Cockx and Francken (2015) evaluated the impact of selected socioeconomic variables on public (health and education) expenditure in the MENA region between 1995 and 2009, using the Fixed Effect (FE) panel regression approach. The findings demonstrate that resource/oil dependence and freedom reduce public expenditure, whereas income growth, aid and population raise public expenditure on health and education. Moreover, Kamaly et al. (2017) employed the Seemingly Unrelated Regressions (SUR) technique to analyse the determinants of public revenue and expenditure compositions (health and education, subsidies, social spending) in selected oil exporting and importing Arab countries between 1990 and 2015. The findings indicate that government effectiveness, oil price, and voice and accountability increase public expenditure and its compositions, whereas low corruption reduces public expenditure components in the oil-exporting countries. Furthermore, Taghavi (2012) studied the role of money outflow on public expenditure, money supply, and inflation and exchange rates in the GCC region between 1990 and 2010, using the dynamic vector auto regression (VAR) and Granger causality techniques. The results, based on the impulse response function (IRF) within the VAR framework, show that public expenditure is responsive to shocks in outflow of money in the 6 countries. The results also demonstrate the presence of a one-way causality from outflow of money to public expenditure in Bahrain, Oman, Qatar and UAE, and not vice versa.

In neighbouring GCC countries, studies have also been conducted from a country-specific perspective. For example, Tamilselvan and Manjula (2019) employed the Johansen cointegration and vector error correction (VECM) (1991) technique to study the public expenditure-economic growth nexus in Oman between 1974 and 2015. Findings from the study suggest that output growth is a significant determinant of public expenditure. Besides, Abdel-Latif et al. (2018) utilised the Nonlinear ARDL (NARDL) bounds testing approach to assess the role of oil price in expenditure on human capital (health and education) in Saudi Arabia, during the 1990Q1-2017Q2 period. The findings show that positive and negative changes in oil price increase public expenditure on human capital (health and education) in the short- and long-run. In addition, Burney and Al-Mussallam (1999) explored the factors which drive public expenditure in Kuwait during the 1969/70–1994/95 period, using ordinary least squares (OLS) method. The findings illustrate that public expenditure in the country is driven by non-oil and service sector growth, trade openness, financial development and public sector.

Despite the expansion in UAE's public expenditure, a survey of existing literature clearly suggests the scarcity of country-level studies on the behaviour of public expenditure in the UAE. Moreover, aside the fact that existing studies are based on cross-country analysis, outcomes from such studies cannot be relied upon due to issues ranging from the use of insufficient datasets and non-stationary series for analysis, and the absence of important post-estimations diagnostics (see Cockx&Francken, 2015; Doğan, 2017; Kamaly et al., 2017; Mourad &Hadadah, 2019; Taghavi, 2012). Also, though GCC countries share similar political,

cultural and social characteristics. However, outcome from cross-country studies which pools these countries together cannot be extended to the UAE due the dissimilarity of UAE's fiscal policy from the other countries and the fact that UAE is the most diversified oil-dependent economy (Malit, Alawad & Naufal, 2017). Therefore, the present study is significant as it seeks to explore the determinants of UAE's public expenditure, using the Gregory-Hansen cointegration and ARDL bounds testing approach. This is even as little attention has been paid to tax burden, fiscal deficit, outflow of money, FDI outflow and interest rate effect on public expenditure. Besides, though there is a growing research into oil price and public expenditure relationship, however, the understanding of the extent of oil price effect on expenditure is far from being conclusive.

3.Methodology and Data

Having explored the public expenditure literature briefly, in this section, the theoretical framework, modelling, data issues and the techniques of estimation are discussed here.

3.1 Theoretical Framework and Model Specification

The present study has its basis in the Wagner (1883) law of increasing state activities. It illustrates that increase in income will lead to higher public expenditure. Though Wagner's law has been adopted to analyse the causes of public expenditure growth (see Goffman & Mahar, 1971; Gupta, 1967; Mann, 1980; Musgrave, 1970). However, its analysis suggests that per capita income is the only determinants of public expenditure (Okafor & Eiya, 2011). Unfortunately, recent studies have demonstrated that besides income level, several political, demographical, economic, and social factors exert great influence on public expenditure (Aregbeyen & Akpan, 2013; Jibir & Aluthge, 2019; Ukwueze, 2015).

In the same vein, and with regards to the UAE, such factors will include oil price ($OILP$). This is not unrelated to the oil-dependent nature of the country, with proceeds from oil sales accounting for a major share of the country's public revenue despite being one of the most diversified oil-exporting country (Mahmah & Kandil, 2019). Moreover, recent empirical studies suggest that oil price is significant in influencing public expenditure in oil-dependent countries (see Abdel-Latif et al.,2018; Aladejare, 2020; Mourad & Hadadah, 2019).

Besides oil price, public expenditure can also be explained by tax burden (TB) through changes in tax revenue. For example, whereas increase in tax burden is expected to translate increased tax revenue. However, a higher tax burden levied on companies may influence economic activities adversely, due to increased cost on the part of economic agents, which in turn reduce the tax base and encourage increase in tax evasion, corrupt practices and underground economic activities (Gamal &Dahalan, 2015; Gamal, Dahalan & Viswanathan, 2020). This consequently leads to fall in tax revenue, and then changes in public expenditure, especially during periods of low oil prices (Lundberg, 2017).

Fiscal deficit (DEF) can also influence the magnitude of public expenditure in a country. Moore et al. (1979) hypothesised that fiscal deficits would often produce higher levels of public spending because of citizens' perception that publicly supplied goods and services are relatively cheaper than they were before

the fiscal policy shift. Moreover, studies have demonstrated that higher fiscal deficit tends to drive up the level of public expenditure (see Christopoulos & Tsionas, 2003; Hondroyiannis & Papapetrou, 2001; Imana, 2017; Jaén-García, 2016; Niskanen, 1978).

Furthermore, outflow of money (OUM) and FDI outflow ($OFDI$) can also dictate the movement of public expenditure. In the UAE for instance, the heavy reliance on foreign labour have ensured the outflow of huge money from the economy (Edrees, 2016; Al Kaabi, 2016). However, evidence suggests that through its effect on exchange rate, foreign reserves, monetary policy, domestic investment and consumption, and the undue pressure which such outflow put on government to shoulder the burden of economic revival, public expenditure can be influenced (see Alkhathlan, 2013; Hathroubi & Aloui, 2016; Naufal & Genc, 2012; Rahmouni & Debbiche, 2017; Taghavi, 2012). Moreover, Hathroubi and Aloui (2016) has empirically demonstrated public expenditure is typically responsive to increase in workers' remittance outflows in an oil-dependent country. In the same vein, FDI outflow can also exert pressure on public expenditure, albeit indirectly, through its effect on employment, productivity and output growth (Masso et al., 2008).

In addition, the possibility of interest rate (IR) influencing public expenditure cannot be totally ruled out. This is largely because research has emphasised that the level and effectiveness of fiscal policy (public expendture) may depend on interest rates, given that shifts in interest rates have the potency of affecting the cost of financing public expenditure and the burden of future fiscal consolidation (Choi & Devereux, 2006). Moreover, public expenditure can even be influenced through the resulting consequences of changes in interest rate on consumption, savings and investment decisions (Obi & Abu, 2009).

Putting the above issues discussed into consideration, an actual public expenditure model in the UAE is specified as:

$$LPEX_t = a + b_1 OILP_t + b_2 TB_t + b_3 DEF_t + b_4 OUM_t + b_5 OFDI_t + b_6 IR_t + \upsilon_t \qquad (1)$$

where $LPEX$ is public expenditure (log transformed); $OILP$ represents oil price; TB denote tax burden; DEF represent fiscal deficit; OUM is outflow of money; $OFDI$ denote FDI outflow; IR is interest rate; and a, b_i, and υ_t represent the intercept, vector of the slope coefficient, and the disturbance term.

Annual datasets for the 1975-2020 period were used for analysis, and the data are measured as follows. $LPEX$ is log transformed non-adjusted absolute value of public expenditure in billions of UAE Dirhams, $OILP$ is measured by the annual spot price of Murban crude oil, TB is the tax revenue-GDP ratio, DEF is proxied by the ratio of budget balance to the GDP. OUM and $OFDI$ are measured as a ratio of outward remittance and FDI to the GDP, while INT is captured using nominal interest rate, respectively. The data were collected from various sources. For instance, data on public expenditure, GDP, public revenue, tax revenue and interest rate are collected from the Federal Competiveness and Statistical Authority (FCSA)(2020) and CBUAE annual reports; FDI outflow from the UAE's Ministry of Economy statistical bulletin; outflow of money from the GCC Secretary General annual report; and [Murban] oil price from Organisation of Petroleum Exporting Countries (OPEC) annual statistical bulletin (2021).

3.2 Estimation Methodologies

3.2.1 Gregory-Hansen Residual Based Cointegration Approach

Given that the UAE has undergone several structural adjustments, especially as a major oil-dependent country whose public expenditure often reflect changes in the global oil market, it is imperative to adopt the residual-based Gregory-Hansen cointegration technique to identify and capture the structural break point (Gregory & Hansen (1996a;1996b).

To test for cointegrating long run relationships with structural breaks, Gregory and Hansen (1996) presented three models to test the null hypothesis of "no cointegration" against alternative hypothesis of "cointegration with a single time break point in an unknown date" based on the extension of the traditional ADF,Z_α andZ_t -test types (Gamal et al., 2020). For the purpose of this study, the specification for the three Gregory-Hansen equations is given as follows:

Model (1): cointegration equation with level shift:

$$LPEX_t = \mu_1 + \mu_2 DU_{tk} + \alpha_1 OILP_t + \alpha_2 TB_t + \alpha_3 DEF_t + \alpha_4 OUM_t + \alpha_5 OFDI_t + \alpha_6 IR_t + \varepsilon_t \quad (2)$$

Model (2): cointegration equation with level shift and trend:

$$LPEX_t = \mu_1 + \mu_2 DU_{tk} + \mu_3 t + \alpha_1 OILP_t + \alpha_2 TB_t + \alpha_3 DEF_t + \alpha_4 OUM_t + \alpha_5 OFDI_t + \alpha_6 IR_t + \varepsilon_t \quad (3)$$

Model (3): cointegration equation with regime shift (full break):

$$LPEX_t = \mu_1 + \mu_2 DU_{tk} + \alpha_1 OILP_t + \delta_1 OILP_t DU_{tk} + \alpha_2 TB_t + \delta_2 TB_t DU_{tk} + \alpha_3 DEF_t + \delta_3 DEF_t DU_{tk} + \alpha_4 OUM_t + \delta_4 OUM_t DU_{tk} + \alpha_5 OFDI_t + \delta_5 OFDI_t DU_{tk} + \alpha_6 IR_t + \delta_6 IR_t DU_{tk} + \varepsilon_t \quad (4)$$

where $\mu_1$denotes intercept prior the level change, $\mu_2$is change in intercept following the break. α_i and δ_i denotes cointegrating slope coefficients before and after time break occurs, respectively. ε is error term, t is time subscript, k denotes time break-point at which break occurred, and DU is dummy variable defined as:

$$DU_{tk} = \begin{cases} 0 \; if \; t \leq k \\ 1 \; if \; it > k \end{cases}$$

Given that the time break-points are endogenously determined, Gregory and Hansen (1996b) constructed three test statistics (ADF^*, Z_α^* and Z_t^*), which corresponds to the conventional ADF and Phillips' unit root tests. The time break date is then chosen when the test statistic statistics value (in absolute term) exceeds the critical values provided by Gregory and Hansen (1996) based Monte Carlo simulations (Gamal et al., 2020). In other words, the null hypothesis is rejected if the ADF^*, Z_α^* orZ_t^* statistic exceeds the corresponding critical value, else, the null hypothesis cannot be rejected.

3.2.2 Autoregressive Distributed Lag (ARDL) Bounds Testing Approach to Cointegration

In assessing the determinants of public expenditure in the UAE, the ARDL bounds testing technique is employed. The preference of the technique over the traditional cointegration techniques is not unrelated to the numerous benefits which it has over the former, and has been extensively discussed in the literature (see Abu, 2019; Abu & Gamal, 2020; Sakanko& David, 2018; 2019; Gamal, Rambeli, Jalil & Viswanathan, 2019). The ARDL(p,q) model to be estimated is specified as follows:

$$\begin{aligned}\Delta LPEX_t = \alpha_1 &+ \sum_{i=1}^{p} \delta_i \Delta LPEX_{t-i} + \sum_{i=0}^{q1} \beta_{1i} \Delta OILP_{t-i} + \sum_{i=0}^{q2} \beta_{2i} \Delta TB_{t-i} + \sum_{i=0}^{q3} \beta_{3i} \Delta DEF_{t-i} \\ &+ \sum_{i=0}^{q4} \beta_{4i} \Delta OUM_{t-i} + \sum_{i=0}^{q5} \beta_{5i} \Delta OFDI_{t-i} + \sum_{i=0}^{q6} \beta_{6i} \Delta IR_{t-i} + \lambda_1 LPEX_{t-1} \\ &+ \lambda_2 OILP_{t-1} + \lambda_3 TB_{t-1} + \lambda_4 DEF_{t-1} + \lambda_5 OUM_{t-1} + \lambda_6 OFDI_{t-1} + \lambda_7 IR_{t-1} \\ &+ \varepsilon_{1t}\end{aligned} \tag{5}$$

where $\Delta$is difference operator, α is intercept; δ and β are the dynamic parameters; and$\lambda_i$captures the lagged levels parameters.

The ARDL bounds testing procedure is conducted by testing the null hypothesis of no cointegration (i.e. $H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = \lambda_7 = 0$) against the alternative hypothesis of cointegration (i.e. $H_1: \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq \lambda_7 \neq 0$). The ensuing f-statistics is then compared with the values of the lower and upper critical bounds provided by Narayan (2005) due to the same sample size, instead of that provided by Pesaran, Shin and Smith (2001). H_0 is then rejected if the f-statistics exceeds the upper bound whereas it cannot be rejected if the f-statistics is less than the lower bound. However, the decision is inconclusive if its fall between the bounds.

If it is confirmed that cointegration exist between the series, then both the long- and short-run coefficients is estimated as follows:

$$\begin{aligned}\Delta LPEX_t = \alpha_1 &+ \beta_{1i} OILP_{t-1} + \beta_{2i} TB_{t-1} + \beta_{3i} DEF_{t-1} + \beta_{4i} OUM_{t-1} + \beta_{5i} OFDI_{t-1} \\ &+ \beta_{6i} IR_{t-1} + \varepsilon_{1t}\end{aligned} \tag{6}$$

$$\begin{aligned}\Delta LPEX_t = \alpha_1 &+ \sum_{j=1}^{p} \delta_j \Delta LPEX_{t-j} + \sum_{i=1}^{K} \sum_{j=0}^{q} \beta_{ij} \Delta OILP_{i,t-j} + \sum_{i=1}^{K} \sum_{j=0}^{q} \beta_{ij} \Delta TB_{i,t-j} \\ &+ \sum_{i=1}^{K} \sum_{j=0}^{q} \beta_{ij} \Delta DEF_{i,t-j} + \sum_{i=1}^{K} \sum_{j=0}^{q} \beta_{ij} \Delta OUM_{i,t-j} + \sum_{i=1}^{K} \sum_{j=0}^{q} \beta_{ij} \Delta OFDI_{i,t-j} \\ &+ \sum_{i=1}^{K} \sum_{j=0}^{q} \beta_{ij} \Delta IR_{i,t-j} + \phi_1 ECT_{t-1} + \varepsilon_{1t}\end{aligned} \tag{7}$$

where ϕ,the parameter of the one period lagged error correction term, ECT_{t-1}, denotes the speed of adjustment to long-run equilibrium after short-term deviation.

4. Findings and Discussions

The presentation and discussion of the estimation results are considered in this section.

4.1 Results of Unit Root Tests

Before estimating the public expenditure model, unit root test was conducted to discern the stationarity property of the series. The Dickey and Fuller's (1979) Augmented Dickey-Fuller (ADF) test and the Zivot and Andrews (1992) test with structural breaks were employed.

Using the optimal lag order of 4 selected based on Schwarz (1978) information criteria (SIC), the results of both tests with intercept assumption presented in Table 1 demonstrate that, except for fiscal deficit which is stationary in level at 5 percent level of significance, all other variables are stationary after taking their first differences.

Table 1: Results of Unit Root Tests

Variable	ADF		ZA				I(d)
	Level	1st Diff.	Level	T_b	1st Diff.	T_b	
LPEX	-1.43	-4.79**	-4.14	2007	-5.27**	2012	I(1)
OILP	-1.46	-6.15**	-3.60	2005	-6.61**	2012	I(1)
TB	-1.66	-7.33**	4.22	2001	-8.08**	2010	I(1)
DEF	-3.71**	-8.65**	-4.97**	1987	-9.18**	2007	I(1)
OUM	-0.93	-4.71**	-2.03	2013	-5.75**	2012	I(1)
OFDI	-2.78	-5.64**	-3.70	2008	-6.74**	2000	I(1)
IR	-2.01	-9.11**	-3.88	1985	9.12**	1987	I(1)

Notes: Both tests are conducted with intercept (random walk with drift). ADF's MacKinnon (1996) critical values for intercept are given as: −3.59, −2.93 and −2.60, at 1%, 5% and 10% levels, respectively. Zivot-Andrews critical values for intercept break are: -5.34 (1%), -4.93 (5%) and -4.58 (10%). The models are estimated by setting the maximum lag to 2, which was selected based on SIC. Asterisks (**) indicate significance at 5% level.T_b refers to different time break points captured from Zivot-Andrews test outcomes which is attributed to different events that occurred and individually affected the series over study.

4.2 Results of Gregory-Hansen Residual-Based Cointegration Approach

The results of the Gregory-Hansen cointegration test, which is analogous to the three test regressions specified in equations (2) – (4) is reported in Table 2. Based on the ADF^* test statistic, the results suggest the presence of cointegration between the series, at 5 percent level of significance, with structural break occurring in the level shift. However, the null hypothesis of no cointegration in level shift with trend, and regime shift (GH-2 and GH-3) models cannot be rejected. Nonetheless, the 1989 which is identified as the break date for the level shift model corresponds to the rapid growth in UAE's public expenditure as well as the recovery of its economy following the rise in oil production and oil prices, both as a direct consequence of the increase in oil demand and commitment of OPEC's members to their quota allocation agreement system in the year 1989 (Central Bank of the UAE [CBUAE], 1990).

Table 2: Results of Gregory-Hansen Cointegration Test

Model	ADF^*	T_b	$t-critical$	Decision
GH-1 (Level shift)	–4.81**	1989	–4.61	Reject Null Hypothesis
GH-2 (Level shift with trend)	–4.37	2007	–4.72	Accept Null Hypothesis
GH-3 (Region shift of full break)	–4.23	2008	–4.68	Accept Null Hypothesis

Notes: T_b is time break. Asterisk (**) denote statistically significance at 5 percent level. Critical values are obtained from Gregory and Hansen (1996, Table 1 pp.109) for m=1.

4.3 Results of ARDL Bounds Testing Approach to Cointegration

The bounds testing mechanism within the ARDL framework is also employed to test for cointegration between the series, with the inclusion of the structural break dummy identified from the Gregory-Hansen procedure, to address structural break issue's effect. Whereas the maximum lag order is set to 4, Akaike's (1979) information criterion (AIC) guides the optimal lag-length selection. The result of the ARDL bounds testing reported in Table 3 demonstrates that the F-statistic (5.60) exceeds the I(1) critical value of 3.65 provided by the Narayan (2005) for n=50, at 5 percent level. Thus, this confirms that the variables are cointegrated, despite a structural break.

Table 3: Results of ARDL Bounds Test to Cointegration with Structural Break

Model	Calculated F-statistics	K
$LPEX = f(OILP, TB, DEF, OUM, OFDI, IR, D\_1989)$	5.60**	7
Critical values for Case II: restricted constant and no trend	I(0)	I(1)
10%	1.92	2.89

5%	2.17	3.21
1%	2.73	3.90

Notes: Critical bounds values are provided by Narayan (2005). Asterisk (**) denotes significance at 5% level. K denotes the number of explanatory variables.

4.4 Results of Estimation of the ARDL Model

Since it is established that the variables are cointegrated, an ARDL(1,4,2,3,4,2,3,1) model is estimated. The results of the long- and short-run of the selected models, alongside the diagnostics test are presented in panel A, B and C of Table 4, respectively.

The long-run results indicate a significant positive association between oil price and public expenditure at 5 percent level. A dollar increases in (Murban) oil price increase public expenditure by 2.6 percent. In addition, tax burden has anadverse influence on public expenditure, and significant at 5 percent level. A percent increase in tax burden causes public expenditure to reduce by 20.4 percent. Besides, fiscal deficit, outflow of money, FDI outflow and interest rate are significant and positively related to public expenditure at 5 percent level. A percent increase in fiscal deficit, outflow of money, FDI outflow and interest rate will raise public expenditure by 2.0 percent, 10.4 percent, 0.41 percent and 5.8 percent, respectively. Lastly, the structural break dummy variable of 1989 is positively associated with public expenditure, and significant at 5 percent level. The coefficient implies about 33.1 percent increase in public expenditure, on average, for every one-point change in time.

The short-run results demonstrate that current oil price is an increasing function of public expenditure at 5 percent level. A dollar increases in oil price increase public expenditure by 0.8 percent in the short-term. In addition, current fiscal deficit and money outflow are inversely related to public expenditure at 5 percent and 10 percent levels, respectively. A percent increase in fiscal deficit and outflow of money leads to about 0.8 percent and 1.3 percent decrease in public expenditure, respectively. Moreover, FDI outflow lagged by one period is negative related to public expenditure, and significant at 5 percent level. A percent increase in FDI outflow lagged by one period cause public expenditure to reduce by 0.18 percent. Besides, current interest rate is positively related to public expenditure in the short-run at 5 percent level. Increase in interest rate by 1 percent raise public expenditure by 2 percent. The structural break dummy variable of 1989 does not affect the public expenditure in the short run. Additionally, the coefficient of the one year lagged error correction term (ECT_{t-1}) is less than unity, negative and significant, and it illustrates that 73% of the deviation is corrected within a year.

The diagnostic tests result (panel C) illustrates that the Lagrange multiplier (LM) statistics and their equivalent probability value for Breusch-Godfrey's test, Ramsey's (1969) RESET, with 1 degree of freedom and Breusch-Pagan heteroscedasticity test are 2.26 (0.13), 2.55 (0.14), and 11.26 (0.99), respectively. These suggest that the estimated model is free from the problems of auto-correlation, misspecification error and heteroscedasticity. Though the Jarque-Bera test statistics with 4 degree of freedom (29.26) and its probability (0.00) indicate that the residuals are not normally distributed. However, evidence suggests that this outcome is not unexpected in estimations involving small sample (see, Abu & Karim, 2021; Ahad, Yin, Othman & Yaacob, 2011). Moreover, the adjusted R-squared ($Adj.R^2$) value indicate that about 83 percent of

variations in UAE's public expenditure is explained by the selected macroeconomic variables, thus indicating that the included variables are able to explain the movements in public expenditure in the UAE.

To determine whether the estimates of the model are stable in the long-term, the Brown, Durbin and Evans' (1975) cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMQ) tests were carried out. The estimated coefficients are adjudged to be stable over time if the CUSUM and CUSUMSQ statistic plots are within the critical 5 percent lines, otherwise they are unstable. The plots in figure 1 and 2 are well within the 5 percent critical value lines, thus implying that the parameters are stable, and so suitable for policy making.

Table 4: Estimation Results of the ARDL Model with Structural Break

Panel A: ARDL (1,4,2,3,4,2,3,1) Long-run coefficient estimates – Dependent variable: $LPEX$							
$Cons$	$OILP$	TB	DEF	OUM	$OFDI$	IR	D_1989
9.852 (38.30)	0.026** (9.79)	–0.204** (2.03)	0.020** (1.97)	0.104** (4.72)	0.406** (4.44)	0.058** (2.05)	0.331** (2.60)

Panel B: ARDL (1,4,2,3,4,2,3,1) Short-run coefficient estimates–Dependent variable: $\Delta LPEX$				
Lag order	0	1	2	3
$\Delta OILP$	0.008 (5.96)**	–0.013 (–4.82)**	–0.005 (–2.74)**	–0.009 (–4.86)**
ΔTB	0.003 (0.08)	–0.030 (0.80)		
ΔDEF	–0.008 (2.64)**	–0.003 (–0.84)	–0.008 (–2.84)**	
ΔOUM	–0.013 (1.30)*	–0.048 (–2.77)**	–0.054 (–3.46)**	–0.056 (–3.55)**
$\Delta OFDI$	0.016 (0.34)	–0.178 (–3.36)**		
ΔIR	0.020 (2.73)**	–0.016 (–2.10)**	–0.020 (–2.79)**	
D_1989	–0.019 (0.27)			

Panel C: Diagnostic statistics tests					
ECT_{t-1}	$\chi^2_{SC}(1)$	$\chi^2_{FF}(1)$	$\chi^2_{HET}(1)$	$\chi^2_{NORM}(1)$	$Adj.R^2$
–0.73 (–8.90)**	2.26 [0.13]	2.55 [0.14]	11.26 [0.99]	19.93 [0.00]	0.83

Notes: The model is estimated by setting the maximum lag to 4, and the optimum lag length is suggested by AIC. Δ is the first difference operator. Asterisk (** and *) denote significance at 5% and 10% levels, respectively. Values in parenthesis "()" in panel A and B are the t-ratio, and values in parenthesis "[]" in panel C are the probability values of the LM test statistics. χ^2_{SC}, χ^2_{HET}, χ^2_N, and χ^2_{FF} denote LM tests for serial correlation, heteroscedasticity, normality and functional form, respectively.

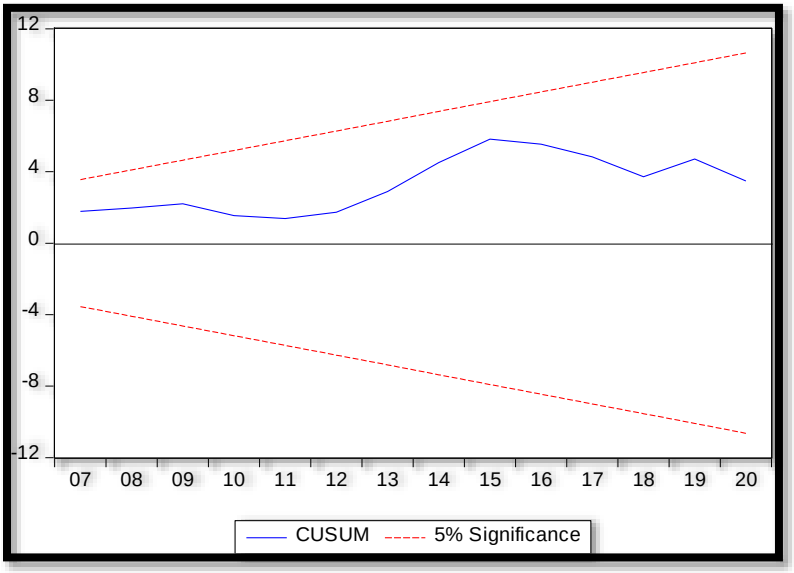

Figure 1: Plot of cumulative sum of recursive residuals

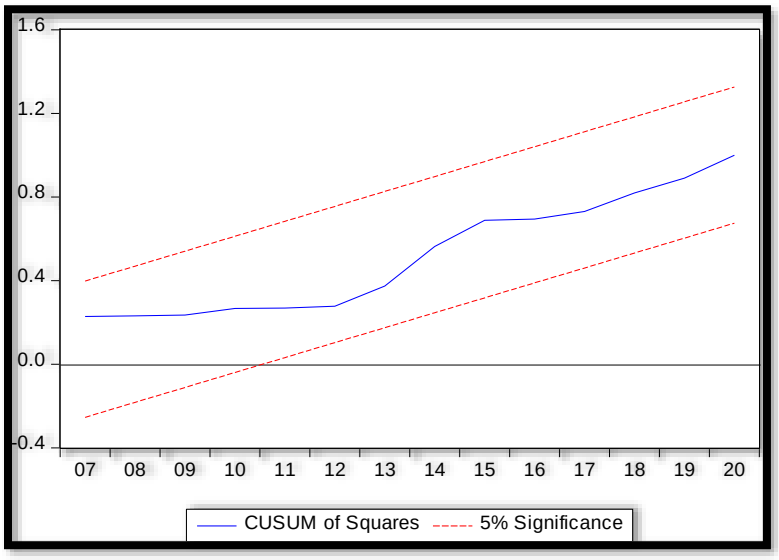

Figure 2: Plots of cumulative sum of squares of recursive residuals

4.5Discussion

The estimation results are quite interesting and revealing. For instance, the increasing effect of oil price on public expenditure in the short- and long-run corroborates the outcome of previous research in oil-dependent countries (see Abdel-Latif et al.,2018; Aladejare, 2020; Jibir&Aluthge, 2019). The relationship suggests that rising oil price is beneficial to the growth of UAE's public expenditure growth despite being the most diversified oil-exporting country in the GCC (Mahmah&Kandil, 2019). Though the price of oil may not directly influence public expenditure, however, it is not unexpected that rise in oil price will not influence oil revenue positively, which further translate to improvement in public expenditure given the significance of oil in the UAE's public revenue. Moreover, increase in oil price is an incentive for UAE citizens to increase their demand for public goods and services, and hence rising public expenditure.

Besides, the inverse relationship between tax burden and public expenditure lends empirical support to the anecdotal submissions of Lich (2019) which demonstrate the negative effect of tax burden on public expenditure, albeit through changes in the level of tax revenue, due to decline in investments, savings, demand and innovations. Besides, despite the role of oil revenue, decline in public expenditure following increase in tax burden is inevitable given the volatility of oil prices. This is coupled to the prevalence of tax evasion practices, corruption and the significant size of underground activities in the country, which thus lead to leakage of tax revenues (Edrees, 2016; Gamal &Dahalan, 2015).

Moreover, while the positive linkage between public deficit and expenditure in the long-run corresponds to findings of previous studies (see Christopoulos&Tsionas, 2003; Imana, 2017; Jaén-García, 2016), and demonstrate the validity of the Moore et al. (1979) hypothesis. However, the adverse effect of fiscal deficit on public expenditure in the short term indicate the rationalisation of public expenditure in a bid to avoid debt-overhand situation following increase in deficit-financed public expenditure. Moreover, as an oil-dependent country, it is not unexpected for the country to cut-down unnecessary spending in the short-term due to negative shocks in oil price. However, in the presence of sustained negative shocks in the price of oil, increase in deficit-financed public expenditure is inevitable.

In addition, the positive connection between public expenditure and outflow of FDI and money in the long-term suggests that outflow of money and FDI will lead to increase in public expenditure due to, inter alia, the attempts by the government to induce inflow of FDI through expenditure in critical infrastructures, and induce consumption and investment through higher expenditure following the outflow of money in form of remittance of migrants which account for almost 90 percent of UAE's population (Edrees, 2016; Al Kaabi, 2016). Interestingly, this finding corresponds to the outcome of Hathroubi and Aloui (2016), whom demonstrate that "increase in workers' remittance outflows is followed by an increase in government expenditures."

Besides, in the short-term, the reducing effect of outflow of money corresponds to the findings of Taghavi (2012), whereas the adverse effect of FDI outflow demonstrates a scenario wherein the sustained negative shocks in oil price slows down public expenditure, particularly overseas investment component of public expenditure, which interestingly account for a significant share of the outward flow of FDI from the country (Malit et al., 2017).

Furthermore, the positive association between interest rate and public expenditure partly corresponds to the anecdotal submission by Choi and Devereux (2006), and also suggests the increase in investment of the UAE government oversea, in the form of Sovereign Wealth Funds (SWFs) owned jointly and/or individually as an emirate, following increase in interest rate given that domestic interest rate moves close to the US Federal funds (Taghavi, 2012).

5. Conclusion

This study evaluates the factors which drives UAE's public expenditure between 1975 and 2020, using the Gregory-Hansen and ARDL bounds testing cointegration approaches. The results demonstrate that there exist a cointegrating (long-run) relationship between public expenditure and its determinants (oil price, tax burden, fiscal deficit, outflow of money, FDI outflow and interest rate), but with a structural break in 1989. Moreover, the results indicate that the major determinants of public expenditure in the UAE include oil price, tax burden, fiscal deficit, outflow of money, FDI outflow and interest rate. In particular, oil price, fiscal deficit, outflow of money, FDI outflow and interest rate are associated with increase in public expenditure, while tax burden reduces public expenditure. In the short-term, the results suggest that oil price and interest rate raise public expenditure, whereas fiscal deficit, outflow of money and FDI outflow reduce public expenditure.

In line with these findings, policies aimed at reducing the dependence of the UAE's public revenue on oil sales, ensuring strict monitoring of tax collection and blockage of tax leakages, reduction of fiscal deficit, elimination of unofficial channels through which money exit the economy, promotion of FDI inflow, and stabilisation of the interest rate are advised.

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